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AN ANNOTATED TRANSLATION OF THE PART OF SCHWEINITZ'S TWO PAPERS[1] GIVING THE RUSTS OF NORTH AMERICA.

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(*Read April 13, 1917.*)

Lewis David von Schweinitz was elected to membership in the American Philosophical Society in 1817, one hundred years ago. He was at the time a resident of Salem, North Carolina, a talented man of forceful character, secretary of the Moravian Missions of North America, and with one important botanical work to his credit. In 1805 there had been published in Leipzig a volume describing the fungi about Niesky,[2] a town of Saxony (later of Prussia), being the joint product of teacher and pupil during Schweinitz's four years' college course. The plates of the volume, with more than a hundred figures, were drawn, engraved and colored by Schweinitz, and much of the text bears the impress of his labor and judgment.

After five years of college teaching subsequent to his graduation, and five additional years in the ministry, he returned to America as general agent of the Moravian church in the Southern States, and became the pioneer mycologist of the New World. He was the only mycologist in the United States who added materially to the literature of mycology during the half century following his recognition by the American Philosophical Society. His *magnus opus*, which was truly a colossal work for the times, no less a work than a systematic account of the known fungi of North America,

[1] The papers referred to are the following:

"Synopsis fungorum Carolinæ superioris secundum observationes," *Schriften Nat. Ges., Leipzig*, 1: 20–131. 1822. The rusts on pp. 65–75.

"Synopsis fungorum in America Boreali media degentium secundum observationes," *Trans. Amer. Phil. Soc.*, II, 4: 141–316. 1832. The rusts on pp. 208, 209, 290–297, 306–314.

[2] Albertini & Schweinitz, "Conspectus fungorum in Lusatiæ superioris agro Niskiensi crescentium," pp. 376, pl. col. 12. Lipsiæ, 1805.

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with nearly 4,000 species and 250 genera, was presented to the scientific world through the *Transactions of the American Philosophical Society,* having been transmitted to the Society April 15, 1831, and issued in printed form about a year later. It is usually spoken of as a "Synopsis of North American Fungi" from the secondary title used at the top of the pages.

It seems, therefore, especially fitting that on the centennial anniversary of Schweinitz's election to membership, the Society should take cognizance of his eminent and invaluable services to science, encouraged and aided as they were by the Society's approval.

No second attempt has followed Schweinitz's effort to present a full survey of the fungous flora of North America until recently, when the "North American Flora," to include all classes of plants from the highest to the lowest, was projected and supported by the New York Botanical Garden. In this work the fungi are to occupy ten or more imperial octavo volumes, and the text is to be supplied by many specialists. One volume is to contain the Uredinales, or rusts, and its preparation has been intrusted to the senior writer of this article, aided by the junior writer and other mycologists. In pursuance of this work it has become necessary to know definitely the extent of the contribution to the subject made by Schweinitz, an amount so considerable in fact that his name is encountered by the systematic student of the American rusts in much the same way that the name of Linnæus is encountered by the student of the flowering plants. The result of the detailed examination of the specimens in the Schweinitz herbarium, now deposited with the Academy of Natural Sciences of Philadelphia, and the interpretation of his published account in the light of this study of his original material, are presented to the Society in the following annotated translation from the Latin into English of that portion of Schweinitz's works pertaining to the rusts.

In Schweinitz's day the rusts were not recognized as a distinctive and sharply defined group of fungi, as they now are, but were to some extent classed with other fungi occurring on living or languishing hosts. They are all of microscopic size, but usually produce some characteristic discoloration or hypertrophy of the substratum, which aids in making them noticeable. In a few instances these

changes in the host amount to conspicuous alterations that attract the casual observer, as in the case of "cedar apples," and all the more so because the distortions are often accompanied by brilliant coloration.

For the study of these small objects Schweinitz was dependent upon lenses of poor definition and no considerable magnification. His chief instrument was undoubtedly the pretentious one now in the possession of his grandson, the eminent oculist of Philadelphia, Dr. Geo. de Schweinitz.[3] This is still in almost or quite as good condition as when purchased probably some time prior to 1817. It was evidently one of the best instruments to be had at that period. As was pointed out in an early paper pertaining to the rusts, the first published on the subject by the senior author,[4] a magnification of dry spores amounting to seventy-five diameters will give an appearance answering to the most detailed parts of Schweinitz's diagnoses. It is considered by Shear & Stevens,[5] who kindly loaned to the writers during the preparation of this paper copies of their manuscripts embodying results of researches pertaining to Schweinitz's scientific labors and collections, that Schweinitz had to deal with a greater handicap than low magnification in his microscopic work. They find that the lack of spherical and chromatic correction of the lenses and the poor illumination must have resulted in decidedly inferior definition.

But in many cases it is clear that Schweinitz drew up the descriptions of his new species without making use of this instrument. He doubtless had some form of hand lens, although considerable inquiry has failed to reveal any present trace of such a glass. Even a simple hand lens seems not to have been used at times, and in general much dependence was placed upon the gross appearance and the changes wrought in the host.

It would be interesting to know what facilities in the way of books were possessed by Schweinitz. Probably his botanical

[3] The instrument was kindly loaned by Dr. de Schweinitz for display before the Society at the presentation of this paper, and is illustrated by Shear and Stevens in *Mycologia* for July, 1917.

[4] Arthur, "The Interpretation of Schweinitzian and Other Early Descriptions," *Amer. Nat.*, 17: 77-78, Jan., 1883.

[5] *Mycologia*, 9: 195, 1917.

library was not large, but what works it contained can only be inferred. There are no records of books having been given to the Academy of Natural Sciences of Philadelphia or to the American Philosophical Society, and no such books are now in possession of his descendants. In a letter to the senior author, dated December 2, 1916, the Rev. Dr. Paul de Schweinitz, secretary of missions of the Moravian Church now living at Bethlehem, Pa., says that his grandfather who died in 1834 "left four sons, the oldest of whom [Emil] was only eighteen. The presumption would naturally be that when his widow died twenty-four years afterward [in 1858] his [botanical] books would have been divided among the sons, but I do not recall seeing any in my father's library. My father [Robert] was the last of his four sons to die." The widow of the third son, Mrs. Edmund de Schweinitz, is still living in Philadelphia and graciously received Dr. C. L. Shear and the senior author on the evening of February 5, 1917, but did not recall having ever seen any of Schweinitz's botanical books.

It is probable that the current works of Pursh, Michaux, Nuttall, Darlington, Bartram, Torrey, Barton, Muhlenberg, and other American botanists of the time were at his disposal in studying the flowering plants. Of these doubtless Barton's "Flora of Philadelphia" (1818), but above all Muhlenberg's "Catalogue" (1813, 2d edition in 1818) and Torrey's writings were in constant use. Although Amos Eaton, of Yale College, published a "Manual of Botany" in 1818, with successive editions until 1840, it does not appear to have been his guide in matters of nomenclature.

There were no American works on fungi at the time Schweinitz was most active in preparing his important contributions. Naturally he brought to this country the knowledge and many of the books which had aided in making the "Conspectus of Fungi about Niesky," prepared by himself and his teacher, Albertini, a work of standard value. In that work, as well as in the Carolina list he followed Persoon very closely as his model, and did not think it advisable to attempt any marked deviation from what he considered an authoritative nomenclature and systematic arrangement. In 1825 Link's treatment of the Hyphomycetes and Gymnomycetes for Willdenow's edition of the "Species Plantarum" became available, and received Schweinitz's full indorsement.

Among the innovations introduced by Link and adopted by Schweinitz in his later work was the use of the genus *Cæoma* to include what had before passed under the genera *Uredo, Æcidium, Peridermium,* etc. These older genera were only half ingested, however, and a sort of double generic name was made, that is, the genus and subgenus were used together: it was *Cæoma* (*Uredo*), *Cæoma* (*Æcidium*), etc. But this proved too clumsy for general use, and we find Schweinitz constantly reverting to the older nomenclature in his comments, as under 2887, *Cæoma* (*Æcidium*) *luminatum,* he speaks of "this Æcidium," not of this *Cæoma,* or of this *Cæoma* (*Æcidium*). Link's genus *Cæoma* never found much support, and eventually fell into disuse, although the older application of the name as a genus coördinate with *Uredo, Æcidium,* etc., is still in favor, these names in the most modern usage constituting form-genera. In the list of species placed by Schweinitz at the end of the volume, as those first detected by him in America, he lists *Æcidium, Ceratites* and *Peridermium* with initial rank, each with *Cæoma* as subgenus, leaving *Cæoma* as a genus to include only the one subgenus, *Uredo,* thus indicating some revolt, or at least inclination to deviate from Link's method. That the form of name given in the final list was no careless indexing but the conclusion of mature judgment seems certain from the use of one of these names in the description of 2932, *P. investita,* where he speaks of "*Æcidium gnaphalitatum,*" the name in the final list, and not of *Cæoma Gnaphaliatum,* as given in the body of the work under 2873.

Another unfortunate innovation by Link faithfully adopted by Schweinitz was the change of specific names having the form of a proper noun, usually in the genitive singular, to the form of an adjective. Thus *Æcidium Galii* became *Cæoma galiatum, A. Berberidis* became *C. berberidatum, A. Violæ* became *C. violatum,* and so on for a dozen or so well-known names, and to this list Schweinitz added many more, *i. e., Cæoma pyrolatum, C. hepaticatum, C. myricatum, C. dracontionatum, C. houstoniatum, C. pedatatum, C. clematitatum, C. helianthatum, C. trachelifoliatum* and eighteen or twenty more, all of them again listed under "Æcidium (Cæoma)" at the end of the volume. These changes with few exceptions were made under the genus *Cæoma.* Link changed a few specific proper

names under the genus *Puccinia* from the singular to the plural, thus *P. Galii* became *P. Galiorum, P. Pruni-spinosæ* became *P. Prunorum, P. Violæ* became *P. Violarum,* etc., and in this was imitated to some extent by Schweinitz as in the change of *Puccinia Helianthi* to *P. Helianthorum.*

All these changes were with the clear intent of making the name more accurately and fully represent the facts pertaining to the species. It was an attempt to carry out the idea that still persisted from pre-Linnæan times, that the name should embody some characteristics of the thing named, and in so far as a binomial name permitted, be descriptive. It was logical, consequently, to bring the name down to date, and upon ascertaining that the rust on *Prunus* was not confined to one species of *Prunus,* as at first supposed, but occurred on more than one, to change the name from *Puccinia Pruni-spinosæ* to *P. Prunorum,* and similarly so for other cases. The same result was even better attained by using a generalized adjective form for the specific name. It must be borne in mind that DeCandolle's dictum that the first name given to a species was the only legitimate name and should not be changed because found to be inappropriate had only been stated in 1813, and had received no general adherence, certainly not by German authors.

Along with the belief in descriptive names went the prevalent idea of the nature of species. Species were treated as concepts. This accounts for Schweinitz's insistence that when Link transfers one of Schweinitz's species to another genus and also changes the specific name in accordance with reasons just stated, or any other, it is Schweinitz and not Link who should be cited for the new form of the name. Schweinitz established *Æcidium Caladii,* and Link changed the name to *Cæoma* (*Æcidium*) *aroidatum,* yet Schweinitz places his initials after the latter name to indicate that it is his species (*i. e.,* his concept), and not Link's species. And so it comes that the names first published by Link, *Cæoma luminatum, Puccinia aculeata, Podisoma macropus,* and many others, founded upon Schweinitz's earlier descriptions of species differently named, are followed by the initials of Schweinitz in his later work.

The collection of Schweinitz's fungi at his death in 1834, was left to the Academy of Natural Sciences of Philadelphia. Each

specimen was preserved in a paper packet, made by folding over the sides of a sheet of paper until they touched or somewhat overlapped, then folding over the ends in the same manner and in the same direction. On the back of the packet an autographic record was made in ink. When a change was necessitated in the label by the adoption of Link's nomenclature, or for other reasons, in many cases the packet was not discarded, but refolded inside out and the data replaced in the new form on the back. This conservative practice, doubtless adopted merely as a convenience in handling, has given a chronological record that has often proved of much value when studying the original material, as showing changes in Schweinitz's views regarding the best form of the name or the identity of the material. The packets were of no uniformity in size, but varied from about three by six centimeters or smaller up to six by ten centimeters, and a few still larger.

Some thirty or forty of these packets were placed loosely in large envelopes, folded in a similar manner to 22 by 38 centimeters from heavy steel-blue paper, and a list of the species inclosed written on the back. Three to five of these envelopes according to bulk were put into a pasteboard portfolio of the same size and seven or eight centimeters in thickness, and tied with tape, the back being lettered with the consecutive number and the genus represented. The whole collection was contained in 39 portfolios, making a series of shelf volumes in outward appearance resembling a set of the modern bound fungi exsiccati. All the fungi were placed in one series, the European, North American and Surinam specimens being intermixed.

The part of Schweinitz's work on North American Fungi with which this paper has to deal is with the exception of eight species comprised under the two genera *Cæoma* and *Puccinia*. The material under *Cæoma*, both American and European, occupies the five envelopes in portfolio no. 38, and embraces 243 packets, of which considerably more than half are now empty. The material under *Puccinia* occupies two of the envelopes in portfolio no. 39, and embraces 84 packets, more than half being empty. Altogether under *Cæoma* and *Puccinia* 178 collections are European, 130 being without specimens, 18 are from Surinam, 3 without specimens, and

131 are North American, 60 without specimens, making a total of 327 packets, of which 193 are empty.

So far as the North American material in the portfolios is concerned, it is only the surplus after a suitable part had been removed for mounting. The Schweinitz collections representing his work on the North American Fungi, were mounted by Dr. Ezra Michener mostly during the years 1856 and 1857. As pointed out by Shear & Stevens (*Mycologia,* 9:337. 1917) the packages of fungi and the mounting material were sent by the Academy of Natural Sciences of Philadelphia to Dr. Michener, the work being done at his home in New Garden, Pa. Even at that time some of the packets were empty, as in a letter to Rev. M. A. Curtis Dr. Michener says: "I have been grieved to find a number of the envelopes either missing or empty." They were doubtless essentially in the same condition when they came into the possession of the Academy some twenty years before. From a letter written to Dr. John Torrey by Schweinitz shortly after his return from Europe in 1819 we learn that he had taken a full set of specimens illustating his new species together with a list of his American fungi abroad with him and left them with Dr. Schwägerichen at Leipzig. This was the North Carolina list printed not long afterward at Leipzig under the editorship of Dr. Schwägerichen. It is not known whether or not these specimens are yet in existence. Taking out this set may have nearly or quite exhausted his supply in some instances. Specimens were also sent to no less than fourteen individuals and herbaria according to Shear & Stevens,[6] among them being his correspondents at Upsala, Kew, Edinburgh, Paris, Berlin, Vienna and elsewhere, which doubtless drew heavily upon his material at times.

So far as concerns the part of the collections examined by the writers it seems that Schweinitz was usually in the habit of making but a single collection to represent a species and when he observed the same species in another locality he merely added the new locality on the outside of the packet. In a few cases he preserved collections, made by himself or sent to him by others, illustrating different hosts, as of 2826 *Cæoma* (*Uredo*) *Solidaginis.* Occasionally he appears to have replenished an exhausted packet by a later

[6] *Mycologia,* 9: 333, 1917.

collection as under 2930 *Puccinia Asteris,* the packet says "on *Aster paniculatus*" but contains only material on *A. cordifolius.* In rare instances he may have placed a second collection of what he believed to be the same form in a packet still having some of the original collection. In most cases, however, the specimens now to be found in the packets appear to represent Schweinitz's first American collection of that form. And so it comes around that when a species had first been found in North Carolina and subsequently found in Pennsylvania or elsewhere the material preserved to represent it generally is the North Carolina collection. This is a most fortunate situation, as the specimen is thus the type for the earlier of Schweinitz's names, when a change was made in the latter work. The present priority rules require the use of the earliest specific name which in the present connection is a name usually much to be preferred for its brevity and aptness.

The fungi from North America in the portfolios as presented by Schweinitz to the Philadelphia Academy were labelled in accordance with his work on North American Fungi, and in large part constituted the basis for that work. Under the genera *Cæoma* and *Puccinia* only one North American specimen occurs not mentioned in his published account. It is labelled "*Æcidium Dircatatum* Ind.," and must have been collected upon his visit to Hope, Indiana, where he went to organize a church. This was in the summer of 1831 and doubtless too late to have the name placed in his manuscript. The packet contains three leaves of *Dirca,* 5 by 7.5 cm., 4 by 8.5 cm., and 5 by 6 cm., the last with part of each end removed, each leaf bearing a single small group of æcia.

Besides the specimens which Schweinitz carried abroad, and those sent to his European correspondents as mentioned above, many were sent to his American correspondents, and especially to his intimate friend, Dr. Torrey. The last were finally given by Torrey either to Curtis and are now in the Herb. Curtis at Harvard University, or to Berkeley, and are now in the Kew Herbarium. After the collection came into possession of the Philadelphia Academy portions of specimens were removed by Curtis for purpose of study during a seventeen-day visit in 1851 (Shear & Stevens, *Mycologia,* 9:335), part of which were transmitted to Berkeley.

Not long afterward the Academy arranged with Dr. Michener to place the collection in a more secure and accessible form, Curtis having been largely instrumental in bringing this about.

In mounting the collection a representative portion, or all when the material was scanty, was taken from each packet and glued to uniform slips of white writing paper 8 by 10 cm., on which the number, name, and source were written as given in the North American Fungi (see cut under no. 2881). In some cases the material was placed in paper packets that were glued to the slips. These mounts were consecutively arranged by pinning them to the inner page of folded sheets of brown paper, and the sheets placed in heavy board portfolios. The portfolios, 12 altogether, are 26 by 36 cm. and tied with tape. There are 85 mounts under the genus *Cæoma,* of which five are smuts, and some others belong to nonuredinalean species, as stated under the several numbers in the systematic account which follows. There are in addition 6 mounts representing rusts, two under *Sphæria,* one under *Seiridium,* one under *Gymnosporangium,* and two under *Podisoma.* The whole genus *Puccinia* is unrepresented.

When the senior author was preparing to make his first visit to the Academy for the purpose of examining some of the types in the Schweinitz collection, he learned from Mr. W. C. Stevenson, Jr. (in letter dated Oct. 19, 1898), a member of the Academy, that part of the mounted collection had disappeared. Few persons had been critically interested in rusts in the recent years, and it was easy to ascertain that none of them had knowledge of the whereabouts of the missing specimens. No one then belonging to the Academy could give any information. It was generally believed that the missing sheets would eventually be found in the herbarium rooms of the Academy. However, a subsequent search failed to bring the missing material to light. The researches of Shear & Stevens regarding the history of the Schweinitz fungi have shown quite conclusively (*Mycologia,* 9:340. 1917) that the material representing nos. 2905–2946 embracing *Puccinia* and some subsequent genera, was mounted by Michener and that the mounted part must have disappeared later. The original packets are still in their envelopes in the portfolios. Fortunately there is some ma-

terial of Schweinitz's forty-two numbers under *Puccinia* in the autographic packets and also in other herbaria. Dr. Farlow states that 32 of these numbers are represented in the Herb. Curtis at Harvard University and Dr. Shear writes that there are 37 in the Michener collection at Washington.

The senior author has consulted the part of the Schweinitz collection containing the rusts a number of times between 1899 and 1917, for a few hours or a few days each time, as other duties demanding a visit to Philadelphia or nearby cities permitted. The first visit of three hours' duration was on Feb. 17, 1899, and a second one of about the same length of time on Aug. 4, 1900. At this second visit the impossibility of satisfactorily deciding upon the identity of many of the collections without better microscopic facilities and more time than could be hoped for while in Philadelphia was forced into prominence. A bit from an ample specimen, such as would furnish a few spores for examination under the microscope, could be carried away when the need was great, without a feeling of having done harm to this precious historical collection, but many specimens were too meager for such liberties. About a score of specimens of the unmounted material were selected at this time which most needed study and a request left to have them sent to Lafayette, Indiana, for more careful examination. But the authorities of the Academy had become wary, their attention having been called recently to the mysterious hiatus in the mounted set, including the important genus *Puccinia*, and had decreed a general ban on all loans. It was not until 1915 that the regulations were so far modified that the privilege was obtained to study these specimens microscopically for a few days in April of that year at the laboratory in Lafayette.

During the four days of December 28–31, 1903, many hours were spent in consulting the collection, at which time the senior author was assisted by Dr. Frank D. Kern, and again much study was given the collection during the five days of December 28, 1914, to January 1, 1915, assisted by Dr. F. D. Fromme. The senior author also consulted the collection on February 5–12, and April 11–14, 1917, Dr. C. L. Shear being present part of the time during the April period and giving valuable assistance in interpreting the

data. A few hours of study were also given on other dates not now definitely in mind. In order to verify and complete the mass of information secured in this fragmentary manner the authorities of the Academy, upon presentation of the situation by Dr. Witmer Stone, the acting curator, most generously transmitted all of portfolio 38 and 39 of the original set, and the final portfolio of the mounted set. These were received in Lafayette, Ind., the latter part of April, 1917, and returned the latter part of February, 1918, in exactly the same condition as when received. Owing to this invaluable opportunity for verification it is believed that the statistics given in the following account are accurate within the limits of ordinary error.

It has been the privilege of the senior author to examine many collections of micro-fungi, and he can say advisedly that the Schweinitz collection shows great care in its labelling and arrangement, and considering the vicissitudes of practically a hundred years, in which the requirements of correspondents, the need of transmitting specimens for examination, the later consultations by visiting mycologists, the ravages of insects and the accidents incident to handling by attendants, is in a remarkably good state of preservation. The packets would have been somewhat more secure, if they had been folded after the modern manner by overlapping the edges more and folding the ends in the reverse direction from that of the sides. But as it is, there is little evidence that specimens have been lost out, or intermixed to any harmful extent. To insure further protection and facilitate examination in the future the senior author in February, 1917, after consultation with Dr. Shear[7] and Dr. Witmer Stone, placed each packet still containing any material, found in the seven large gray envelopes marked *Cœoma* and *Puccinia,* whether American or foreign, into small manila envelopes and wrote the name on the front. Of the 140 numbers in the North American list under the genera *Cœoma* (exclusive of the subgenera *Albugo* and *Ustilago*), *Puccinia, Phragmidium, Podisoma* and *Gymnosporangium,* 103 are represented at this date by specimens in the

[7] Dr. Shear, of the Bureau of Plant Industry, Washington, D. C., and the senior author are members of a committee from the American Phytopathological Society to give whatever assistance may be possible in the preservation of the Schweinitz Herbarium.

collection at Philadelphia, either in the original autographic packets or mounted. Of the additional species of rusts, two under the genus *Sphæria* and two under *Seiridium,* there are three represented by specimens.

The careful and conscientious work of Schweinitz is further evident in the identification and naming of his material. This can be shown by examination of the species which Schweinitz considered to be new, and to which he attached his initials. In the North Carolina list there are 45 such species under the genera *Æcidium, Uredo* (exclusive of the subgenera *Albugo* and *Ustilago*), *Puccinia* and *Gymnosporangium,* and of these only one was wholly misunderstood, nine are still accepted under the full names given by Schweinitz, twenty-one still have the same specific name but are placed under other genera and fourteen only have the name wholly suppressed under synonymy. In the North American list there are 88 names followed by the initials of Schweinitz under the genera *Cæoma* (exclusive of the subgenera *Albugo* and *Ustilago*), *Puccinia, Phragmidium, Gymnosporangium* and *Podisoma.* Only four of these species were misunderstood and erroneously placed, while twelve are still accepted as named, twenty-four still retain their specific names under other genera, and forty-eight have the whole name relegated to synonymy. The discarding of over half of the new names found in the later work is largely due to Schweinitz's replacement of earlier names by others conforming to Link's new methods, as already explained, which made them untenable according to the present requirements of priority. The above showing is as good as can be found in most lists of rusts by recent mycologists, so rapid are the mutations in nomenclature of this group of fungi. In general it shows that Schweinitz made comparatively few mistakes in the identification of his material, and in naming tried very commendably to follow the most progressive and authoritative methods as then understood. At the present time the two or three dissimilar stages which many rusts exhibit are included under one name, while formerly they were placed under separate genera. This in large part accounts for the 125 numbers in Schweinitz's North American list, now known or believed to represent rusts, having shrunken to 90 species as at present classified.

The very large part of the material, which was the foundation of Schweinitz's two works, especially of the portions relating to the rusts, was secured by himself. He collected over a radius of thirty miles or so about Salem, North Carolina, and probably over even a wider radius about Bethlehem, Pennsylvania, the two localities in America where he resided. A very few collections were made upon his trips to more distant points, and some specimens were sent to him by his correspondents, especially by Torrey and Halsey, of New York, and Collins of Philadelphia, while a few were handed to him by friends whose names appear at times upon the packets, particularly Detwiler and Denke.

The earliest biographical account of Schweinitz is that by Walter R. Johnson, read before the Philadelphia Academy of Sciences, May 12, 1835, a little more than a year after his death. It has been the source of information for many later sketches, notably those by Morgan,[8] Kellerman,[9] Shear,[10] Harshberger,[11] and Lloyd.[12] Other writers have added various facts, obtained from Schweinitz's descendants, especially Gore,[13] Youmans,[14] Lehman,[15] and Shear & Stevens.[16]

The three articles by Shear & Stevens were the result of extended researches regarding the history of Schweinitz's collections of fungi, his methods of work, and the present disposition of his specimens. Manuscript copies of the last two papers, as well as the one on Ezra Michener (*Bull. Torrey Botanical Club,* 44: 547–558, Dec., 1917) by the same authors, were generously loaned to the writers while this article was in preparation. Most of the works of various kinds referred to by the several authors have also been at the disposal of the writers. They have also consulted the manu-

[8] *Bot. Gaz.,* 9: 17–19, 1884.

[9] *Jour. Myc.,* 2: 31–34, 1886.

[10] *Plant World,* 5: 45–47, 1902.

[11] "The Botanists of Philadelphia," 127–132, 1899.

[12] *Mycological Notes,* No. 44, 1916.

[13] *Jour. Elisha Mitchell Sci. Soc.,* 3: 9–25, 1886.

[14] *Pop. Sci. Mo.,* 44: 833–840, 1894; and "Pioneers of Science in America," 167–175, 1896.

[15] *The Wachocia Moravian,* 13[142]: 4–6, 1904.

[16] U. S. Dept. Agric. Bull. no. 380: 1–82, Jan., 1917; *Mycologia,* 9: 191–204, 333–344, July, Nov., 1917.

script works of Schweinitz and the letters (amounting to 237) from his correspondents deposited at the *Philadelphia Academy of Natural Sciences*, the letters from Schweinitz to Torrey (35 in number) at the New York Botanical Garden, and the letters from correspondents in the possession of his grandson, Dr. Geo. de Schweinitz, of Philadelphia.

Some of his biographers say that during the latter years of his life he used *de* in place of *von* in his name. It is quite certain that after his death his sons and their families used the French form of the name, as their descendants do at the present time. His correspondents addressed him variously. By German friends and many others the address used was *Herr von Schweinitz,* or by a few of them *Baron von Schweinitz,* while a less number used *de Schweinitz.* His intimate American friends, Torrey and Darlington, both of English descent, invariably used *von.* All of the Schweinitz letters to Torrey at the N. Y. Bot. Garden are signed *Lewis D. v. Schweinitz;* they extend from June 24, 1820, to May 2, 1832. His published writings bear this form of his name on their title pages, except when made to conform to the Latin. The initials invariably used on his packets of fungi and other collections were *LvS.* When used in print to indicate authorship they were written *L.v.S.* In the North Carolina list the abbreviation was *Sw.*

There were doubtless reasons why he might have favored a change in the family name, either out of consideration for his wife, who was of French ancestry, or because of his dislike to Prussia, which at the Congress of Vienna in 1815 had acquired a third of Saxony, including that part where the ancestral home was situated and where his youth had been passed. But it is quite probable that he himself did not adopt the new form.

The botanical work of Schweinitz was made the avocation of a busy life largely devoted to religious duties and churchly service. He was imbued, nevertheless, with the most thoroughly scientific spirit. His monographic work upon the very difficult genera, *Carex, Viola,* and *Sphæria,* was of the highest order. He eschewed the easy assumptions too rife in his day, and believed that a scrutiny of facts outweighed all plausibilities. What may be designated as his scientific creed is given in the preface to the Conspectus by Albertini &

Schweinitz, which was doubtless written by Schweinitz. It refers especially to the study of fungi, and as translated by Johnson (Memoir, p. 25) reads:

> "A solid basis to this department of botanical science must be laid, not on a sandy foundation, on the varying freaks and fancies of the mind, but on a perpetual daily and nightly employment of microscopic observation, a diligent and oft-repeated examination of the whole history of the fungous tribes, a careful perusal of authors, a comparison of their respective synonyms, and above all, by the observation of living nature herself, as she unfolds her rich abundance in the recesses of forests, lawns and marshes, an observation which must be continued from day to day, and from year to year."

The following account includes a translation of that portion of Schweinitz's two works pertaining to rusts, given in the order of the later one, together with a record of material still remaining to represent them, and with comments by the writers. It has been prepared with a view of making this monumental work more available to students, especially students of American mycology.

Following the main body of the work all of the species of rusts mentioned by Schweinitz are arranged in systematic order in accordance with present ideas of classification. The accepted names used for the hosts are generally those of Britton & Brown's "Illustrated Flora," 2d edition, or of Small's "Flora of the Southeastern United States," 2d edition.

A serial list is then given of all the numbers in Schweinitz's "North American Fungi" with which this account deals, with the corresponding numbers from the North Carolina list in parentheses, and in a parallel column the name or fact which the study of the material has disclosed. An index of hosts and another of fungi are appended for convenience of reference.

The microscopic and bibliographical work carried on in connection with this study of the Schweinitz material pertaining to rusts during the eighteen years since the work has been in progress has been done in large part at Lafayette, Ind., in the laboratories of the agricultural experiment station of Purdue University. More than a dozen of those associated in the laboratory work during this long period have taken part in the study, and to them, and to a number of correspondents credit is accorded for material aid. To the

authorities of the Philadelphia Academy of Sciences the gratitude of the authors and of every scientific person interested in this subject is due in unstinted measure. Under Mr. Stewardson Brown, Curator of the herbarium, and Dr. Witmer Stone during Mr. Brown's absence, every facility that the Academy could offer has been placed freely at the disposal of the authors.

Rusts of North America Recorded by Schweinitz.

The arrangement is that in Schweinitz's Synopsis Fungorum in America Boreali. Additions to the translation of the original text are in square brackets. The general serial number is followed by the species number under each genus. As stated by Schweinitz on page 144 of his work "species preceded by an asterisk are those not recorded in the 'Synopsis Fungorum Carolinæ Superioris.' Species with L.v.S. added were first described by me either in my previous work or in the present one."

After the complete record for each number the corresponding record in his "Synopsis Fungorum Carolinæ Superioris," if there is one, is given in parentheses.

Following the English version of Schweinitz's words is a statement of the material to represent the number as it occurs in the Schweinitz Herbarium at the Philadelphia Academy of Sciences at the present time, the data on the packets being copied exactly as to spelling, capitals, punctuation, etc. Finally come comments by the authors.

1474. 329. S[phæria] epiphylla, L.v.S., Syn. Car. 130, F. 258, not in Pennsylvania.

(130. [Sphæria] epiphylla Sz.

S. cespitose, blackish brown, shining, the pulverulent receptacle yellowish, spherules without ostioles, obovate, very minute, crowded, arranged cespitosely or fasciculately.

It grows in an unusual place, namely, upon still growing leaves of Galega virginica. Scattered, on the upper surface of the leaves, punctiform, or oblong or linear, less than a line in diameter. Receptacle arising from the altered substance of the leaf, pulverulent, yellowish or brownish. Spherules globose, minute, obovate. At a younger stage subpellucid.)

Represented by two leaflets mounted, each about 2.5 cm. long,

and by the original packet, empty, labelled on the front "Sphæria epiphylla LvS . . . Salem . . .," a portion not being legible, and on the folded end "Sphæria epiphylla Salem."

While Dietel was making a study of the genus *Ravenelia,* he received a fragment of the original Schweinitz collection, sent by Lagerheim from the Herb. Fries, from which he was enabled to transfer the species to that genus (*Hedwigia,* 33:27. 1894), although he points out that the true nature of the fungus had already been detected (Farlow & Seymour, "Host Index," page 30. 1888). The name is now generally written *Ravenelia epiphylla* (Schw.) Diet.

*1487. 342. S[phæria] canaliculata, L.v.S., of the same group [as the preceding species, 1486], but abundantly distinct, Bethlehem, on leaves of the involucres of Cyperus, found on the dorsal surface. S. covered, dark, composed of series of perithecia situated between the striæ of the leaves, parallelly confluent on a pitch black spot, so that the spot appears beautifully canaliculate; rather large. Ostioles thick, punctiform. On the margin occur subsolitary, subrotund, applanate perithecia. In the middle, moreover, the pitch black spots are sometimes sterile—and, it may be noted, the spot is frequently interrupted at intervals of a quarter of an inch, so that the unaltered substance of the leaf comes into view.

Represented by a mounted specimen, consisting of a portion of five leaves, originally six, one having become detached and lost, each portion about 5 cm. long and 6 or 8 mm. broad, well supplied with uncovered uredinia and covered telia. The original packet contains two small pieces of leaf, and is labelled "Sph. *canaliculata* LvS in Scirpi involucr." It was evidently first labelled "Sph graminis," as the word "graminis" has been crossed out.

The true character of this fungus was first pointed out by Lagerheim (*Tromsö Mus. Aarsh.,* 17:51. 1895), from the study of an original autographic specimen in the Fries Herbarium. It is now called *Puccinia canaliculata* (Schw.) Lagerh., and is a widespread American species.

*Species preceded by an asterisk are those not recorded in the "Synopsis Fungorum Carolinæ Superioris."

Class V. GYMNOMYCETES (Entophytæ and Tuberculariní Fries).

Series I. Entophytæ.

Genus 211. Cæoma.

α Subgenus Uredo.

1. *Ustilago.*

Note.—The six species under this heading nos. 2811 to 2816 are smuts belonging to the Ustilaginales, and are therefore omitted.

2. *Rubigines* (Orange-yellows).

2817. 7. C. U. Rubigo, Lk. n. 9. Halsey from New York, on cereals.

Represented by part of a leaf, 6 cm. long, mounted, and a similar piece of leaf, nearly as long, in the original packet, each about 1 cm. broad. The packet is labelled "Uredo *tecta* Halsey," and again later "Cæoma rubigo Newyork Halsey."

Both leaves appear to be those of wheat (*Triticum vulgare* Vill.), and are well covered with large, scattered, oblong uredinial sori.

The name was correctly applied by Schweinitz in the sense in which it was first employed by De Candolle and others of the times. It covers a number of species, however, and the one represented by the collection is *Puccinia graminis* Pers., in its uredinial stage, now usually called *P. poculiformis* (Jacq.) Wettst.

2818. 8. C. U. linearis, Lk. n. 8, Syn. Car. 464, on leaves of cereals, Salem, Bethlehem, and everywhere.
(464. 6. [Uredo] linearis. Fairly common on grain.)

Represented by portions of four narrowly linear leaves, each piece 8 to 10 cm. long, loose in a mounted packet, bearing a few scattered uredinial sori. The original packet is labelled inside "Uredo linearis Sal," and outside "Cæoma (Ured) lineare Salem."

The compound microscope easily shows the rust to be the uredinial stage of *Puccinia Poarum* Niessl now more often referred to *P. epiphylla* (L.) Wettst. It is characterized by peculiar capi-

tate paraphyses. The host is the common Kentucky blue-grass, *Poa pratensis* L. It is a species not found on other grasses or on grains, although uredinia of similar gross appearance are found on both, and were all given the same name by older mycologists. Probably the original portion of the material on cereals was removed by Schweinitz, leaving only the part on meadow grass.

***2819. 9. C. U. rimosum, Lk. n. 14, rather rare on Scirpus near Hope, New Jersey.**

Represented by one 5 cm. mounted piece of a terete culm, and five similar pieces, 3 to 5 cm. long, in the original packet, which is labelled "Cæoma (Ured) rimosum in Scirp acut. spec. imperfecta ob bonas pertus. Hope Jersey." The host is undoubtedly *Scirpus lacustris* L. (*S. acutus* Muhl.), the plant that Schweinitz took it to be.

The smooth surfaces of the culms show a few quite regular rifts, 5–15 mm. long, but no spores or fungus of any kind. These rifts may have been interpreted by Schweinitz to be the "acervis in rimis longitudinalibus parallelis positis" of Link's description, for he has entered on his packet that he had an "imperfect specimen on account of marked perforations." Link's *Cæoma rimosum* was, however, founded upon a fungus on *Juncus acutus* from Egypt, and could not have been the same as an American fungus on *Scirpus*. Lagerheim in his study of the rusts in the Herb. Fries (l. c., page 67) has erroneously added "Uredo rimosa Schwein." as a synonym of *Puccinia obtecta* Peck, a rust that occurs on both *Scirpus pungens* (the host in the Herb. Fries from New York), having triangular stems, and *S. lacustris,* having terete stems. Had this rust been present Schweinitz would probably not have referred it to Link's species, because of the slight resemblance which it bears to Link's description.

***2820. 10. C. U. Andropogi, L.v.S., on leaves of Andropogon avenaceum, Bethlehem; rare and related to C. longissimum, from which it differs particularly by an evident purple spot.**

C. spots much elongated, narrow, purple. Sori much elongated, parallel, narrowed, longitudinally erumpent from the raised epidermis. Spores at last loosely scattered, globose, rufo-fuscous.

Represented by parts of two leaves, about 5 cm. long, and of two others, 7 cm. long, all 5 to 8 mm. wide, mounted, and in the original packet five similar pieces with some fragments, all bearing an abundance of brown uredinia and a few telia. The packet is labelled inside "Cæoma (Ured) Rubigo Lk in Androp. avenacei fol Beth 1829," and outside "Cæoma (Ured) *Andropogi* LvS."

The host is evidently *Andropogon avenaceum* Michx., as stated, now often referred to *Sorghastrum nutans* (L.) Nash, and the rust proves to be *Puccinia virgata* Ellis & Ev., a species not at all related to *P. Andropogi* Schw., no. 2911.

*2821. 11. C. U. Iridis, L.v.S., frequent on withered leaves of Iris virginica, Bethlehem.

C. related to C. Lilii; spots yellowish, sori roundish oval, not circinate but scattered; at first covered with the epidermis, rather elevated. Spores numerous, somewhat pedicelled, fulvo-ferrugineous, at length scattered. Spores never turn black as in C. Lilli.

Represented by two well-preserved pieces of leaves mounted, one being 1 by 6 cm., and the other 1.5 by 7 cm., and two pieces much eaten by insects, in the original packet, and all well covered with uredinia. The packet is labelled "Puccinia *Iridis* LvS Beth," with the word Puccinia crossed out and "Cæoma (Ur)" substituted. There is an empty duplicate packet labelled in a similar way.

The rust is a common one of both hemispheres for which the accepted name is *Puccinia Iridis* (DC.) Wallr. In America, east of the Rocky Mountains, only uredinia have been found. Although the host is called *Iris virginica*, a linear-leaved species, both because these leaves are especially wide, and because no rust is known on that species, the host must be *I. versicolor* L.

2822. 12. C. U. Smilacis, L.v.S., Syn. Car. 471, Link n. 22, and Bethlehem on leaves of Smilax.

(471. 13. [Uredo] Smilacis Sz.

U. peridia variably flexuose, minute, grouped, often concentric, dark brown, the spore-mass luteo-fuscous.

Frequent, on leaves of Smilax rotundifolia, seated on yellowish spots.)

Represented by one piece of leaf 3 by 4 cm., cut from a leaf of probably twice the size, and mounted. It is thickly covered with

uredinia. The empty, original packet is labelled inside "Uredo *Smilacis* S. rotundifol Sal," and outside "Cæoma (Ured) Smilacis LvS in S. rotundifol Salem."

The rust is the uredinial stage of *Puccinia Smilacis* Schw., no. 2916, very common in the southeastern states on various species of *Smilax*.

2823. 13. C. U. Labiatarum, Lk. n. 34, Syn. Car. [as] U. Clinopodii, 469, and Bethlehem on species of Pycnanthemum.
(469. 11. [Uredo] Clinopodii Sz.
U. orbicular, somewhat inflated, yellowish.
Frequent in autumn on the leaves of Clinopodium incanum.
Related to U. Menthæ.)

Represented only by an empty packet, which is labelled inside "Uredo Clinopodii In Pycnanth. Salem," and outside "Cæoma (Ur) *Pycnanthemi* LvS C. clinopodii Salem." Without doubt Schweinitz had the uredinia of *Puccinia Menthæ* Pers., on *Koellia incana* (L.) Kuntze, of which the preceding names are synonyms. He accepted Link's disposition of his new species as a synonym under Link's name for all the common mint uredinia.

2824. 14. C. U. Ipomeæ, [L.v.S.,] Syn. Car. 468, Lk. n. 38, not Pennsylvania.
(468. 10. [Uredo] Ipomœæ Sz.
U. rather small, sparse, not confluent, bright red.
Frequent on the lower surface [of leaves] of Ipomœa triloba.
Related to U. Tussilaginis.)

Represented by three cordate leaves, 3 cm. long, mounted, well covered beneath with uredinia and telia, and two smaller leaves attached to a slender stem, in the original packet, bearing a few sori. The packet is labelled inside "Uredo Convolvuli Salem," afterward "Ipomœæ" written above Convolvuli, and outside "Cæoma (Ur) *Ipomeæ* LvS in Ip. pandur. Salem."

The rust is an excellent example of *Coleosporium Ipomœæ* (Schw.) Burr., showing uredinia and telia, and the host is doubtless *I. pandurata* L., which was at first confused by Schweinitz with the more southern species, *I. triloba*. Although Schweinitz incidentally omitted his initials as author of the specific name in accordance with his custom in other similar instances, L. v. S. should be added,

for while the combination with *Cæoma* was first made by Link, it was based entirely on Schweinitz's account in his Carolina list.

2825. 15. C. U. Elephantopodis, L.v.S., Syn. Car. 467, Lk. [n.] 54, only in Carolina.
(467. 9. [Uredo] Elephantopodis Sz.
U. rather large, sori depressed, sparse, circular, bright yellow.
On leaves and stems of Elephantopus tomentosus, very frequent in the autumn. Related to U. farinosa. Older sori leave Peziza-like hollows in the leaf.)

Represented by a leaf, 4 by 7 cm., mounted, and also a fragment of leaf in the original packet, both showing uredinia. The packet is labelled inside "Uredo *Elephantopodis* Salem," and outside "Cæoma (Ur) *Elephantopodis* LvS Salem."

The rust is now called *Coleosporium Elephantopodis* (Schw.) Thüm. As indicated for the preceding number Schweinitz adds his name to the Cæoma combination as author of the species although the combination was first made by Link. This was in accord with the opinion then held that the author's name was attached to the species as a voucher for the concept as expressed by the original description and not for the technical formation of the name as applied to a particular specimen, according to present usage.

2826. 16. C. U. Solidaginis, L.v.S., Syn. Car. 472, common, and Pennsylvania.
(472. 14. [Uredo] Solidaginis Sz.
U. compact, closed, red, linear, sometimes long.
Very frequent, almost all large Asters. Solidagos, Vernonias; related to U. pustulata.)

Represented by four original packets, and mounted material from two of them. Two smooth lanceolate leaves, probably of *Solidago serotina* Ait., showing purple discolorations, are mounted, evidently taken from the empty packet marked "1 Cæoma (Ured) *Solidaginum* LvS in maculis purp." A duplicate packet, also empty, is labelled "2 Cæoma (Ured) Solidagini LvS." The other mount consists of about two thirds of a smooth, lanceolate leaf with entire margin, probably of *Solidago sempervirens*. It was doubtless taken from the empty packet labelled inside "Uredo (Æcidium) ovale Nyk Halsey," and outside "Cæoma ovale Halsey Nyk," with the

word "ovale" crossed out and "Solidaginis" substituted. Halsey was a correspondent living in New York. The fourth original packet is labelled inside "Uredo Solidaginis in Vernonia noveboracens Beth," and outside "Cæoma (Ur) *Solidaginum* LvS Salem & Beth." The packet contains the larger part of four lanceolate leaves, each fragment about 18 mm. wide and 7 cm. long. Three of these leaves are yellowish and are doubtless *Solidago altissima,* and may have been obtained at Salem, the fourth is greenish with sparse, colorless hairs, and is doubtless *S. rugosa,* and may have been obtained at Bethlehem. The inclusion of *Vernonia* may after a time have been considered erroneous, and the leaves removed.

All the seven leaves representing this number show uredinia of *Coleosporium Solidaginis* (Schw.) Thüm., one of the commonest of rusts in the eastern states. The unusual abundance of material preserved to illustrate this number was doubtless due to its being encountered frequently in the fields on many hosts.

2827. 17. C. U. Terebinthinaceæ, L.v.S., Syn. Car. 473, not in Pennsylvania. (473. 15. [Uredo] Terebinthinaceæ Sz.

U. aggregated, almost solid, pustulate, closed, becoming indurated, orange red, rather large. Frequent on the lower surface of the very thick leaves of Silphium terebinthinaceum. Related to populina.

N. B. They [i. e. the Rubigos] occur on almost all autumnal plants of the class Syngenesis, as on Helianthus, Aster, Solidago, etc., etc. As to the Rubigos, which ones constitute distinct species, it is most difficult to decide.)

Represented only by an empty packet, labelled inside "Uredo *terebinthinaceæ* in Silph terebint Salem," and outside "Cæoma (Ur) *Silphii terebinthinaci* LvS. Salem."

The rust is undoubtedly *Coleosporium Terebinthinaceæ* (Schw.) Arth., and the host *Silphium terebinthinaceum* Jacq.

Schweinitz's observation that it is difficult to decide upon the systematic distinctions among orange-yellow uredinia remains largely true at the present day.

*2828. 18. C. U. Helianthi L.v.S., rather rare on leaves of *H. giganteus,* Bethlehem.

C. spots obscure. Sori clustered, naked, pulvinate, flavo-rubrous, at first rather solid, finally sprinkled with the minute orange red spores.

Represented by parts of two small, lanceolate leaves. The smaller one, about 4 cm. long, is mounted, and is doubtless *Helianthus giganteus* L. The other, about 7 cm. long, is half in the original packet, which is labelled "Cæoma (Ured) *Helianthi* LvS in Helianth gigant. Bet," and half mounted. It is possibly *H. strumosus* L. A similar leaf, 4 cm. long by 1 cm. broad, and evidently part of the latter collection, is in the Michener Collection at Washington, now belonging to the U. S. Department of Agriculture.

The leaves all show many telia and a few uredinia, of what is now called *Coleosporium Helianthi* (Schw.) Arth. It is not an abundant species, but is widespread.

*2829. 19. C. U. Anemonis, L.v.S., on under surface of [leaves of] Anemone quinquefolia, Bethlehem, rare.

C. spots yellowish, rather large, sori roundish, dilated, slightly elevated, spores pale.

Represented by a compound trifoliate leaf about 4 cm. broad and long, mounted, having plenty of pale round uredinial sori beneath. The original packet is labelled inside "Uredo anemones," and in another place "Cæoma *Anemonis quinquefoliæ* Bethl," while outside it reads "Cæoma (Ur) *Anemonis quinquefo* LvS Detwyler Bethl H."

As no such rust has been collected since on the host named, there has been much speculation regarding its identity. Not until the senior author's recent visit to examine the Schweinitz material at the Philadelphia Academy did the solution of the enigma become evident. It was then noticed that this so-called *Anemone* leaf is sparsely sprinkled with long colorless hairs, which remind one of those on *Osmorrhiza*. Comparing this leaf with material for no. 2841 and no. 2851, which had previously been determined as *Osmorrhiza*, left no doubt that all were the same host. On this host occurs *Puccinia Pimpinellæ* (Str.) Mart. (*P. Osmorrhizæ* C. & P.), with the uredinia of which this material exactly agrees.

This instance illustrates the danger in collecting too small speci-

mens, mere fragments. The large decompound leaves of the tall growing *Osmorrhiza* could not be mistaken in the field for the little wind-flower, but the trifoliate tip of one of the large leaves when isolated might well be supposed to be the whole leaf of a small plant.

2830. 20. C. U. Campanularum, Lk. 44, on C. amplexicaulis, Syn. Car. 465, and Bethlehem.
(465. 7. [Uredo] Campanulæ. Rarely occurs on Campanula perfoliata.)

No specimen or packet is in the collection to represent this number. The host is one on which there is no other record of a rust, although a species of *Coleosporium* does occur on the closely related genus *Campanula* as now understood. It is highly probable, however, that Schweinitz had some fungus not a rust. The plant is now known as *Specularia perfoliata* (L.) A. DC. (*Campanula perfoliata* L., *C. amplexicaulis* Michx.).

2831. 21. C. U. Onagrarum, Lk. 32, Syn. Car. Circææ, 466, and Bethlehem.
(466. 8. [Uredo] Circææ. Here and there on the leaves of Circæa Canadensis.)

There is no material or packet at Philadelphia to represent this number, which is unfortunate, as no common rust exactly answers the requirements of the record. The names employed for the rust are of a European species, not known in America. *Uredo Circææ* was established by Albertini and Schweinitz in their work on the Lusatian fungi for the uredinia of what is now called *Pucciniastrum Circææ* (Schum.) Schröt. The only rust on *Circæa* in this country is *Puccinia Circææ* Pers., which is so very unlike the one just referred to that it seemingly could not have been mistaken for it. Although *P. Circææ* possesses no uredinia, yet the young telial sori are pale and in gross appearance might be so considered. The record in both publications appears to parallel the corresponding records of *P. Circææ* under no. 2938, and the most reasonable interpretation appears to be that Schweinitz mistook the young stage of *P. Circææ* Pers. for a *Uredo*.

2832. 22. C. U. miniata, Lk. 84, Syn. Car. 463, Salem and Bethlehem.
(463. 5. [Uredo] miniata. Frequent but only on Rosa pauciflora.)

Represented by a mounted rose leaf, 7 cm. long, consisting of five leaflets, and the original packet containing one smaller compound leaf and a number of leaflets, all similar. There are large, irregular sori on rachis and midribs and annular, pustulate sori on the blades, all æcia. The packet is labelled outside "Cæoma (Ur) miniata Salem," and added later "& Bethl & Herrnht." Herrnhut is the place where Schweinitz studied in Saxony.

The material apparently is that gathered at Salem, N. C., and the addition of two other localities to the packet indicated the collector's field observations, and not his actual addition to the collection. The host name of *Rosa pauciflora* is given in Muhlenberg's "Catalogue" as synonymous with *R. carolina* L., the name now in use, which is doubtless the species Schweinitz found the rust on. The rust proves to be the aecia of *Earlea speciosa* (Fries) Arth., formerly called *Phragmidium speciosum* Cooke. Telia of this species were placed by Schweinitz under the genus *Sciridium*, no. 3084. The species is not known in Europe, and the selection of Persoon's name, *Uredo miniata*, has proven unfit, although at the time the two forms could not well have been separated. The transfer of the species to the genus *Cæoma* was first done by Schweinitz, not by Link.

*2833. 23. C. U. ruborum, Lk. 86, frequent, Bethlehem.

Represented by no mounted specimen, but by some ten leaflets in the original packet, which is labelled inside "Cæoma ruborum, Uredo (Rubigo) Rubi In Rub id horti mei fr Oct. 1824," and outside "Cæoma (Ur) Rubi Idæi Bethl in hort." The largest of the leaflets is about 6 by 7 cm., and all are pale tomentose beneath, with powdery groups of urediniospores here and there in the tomentum.

The host is doubtless the European red raspberry, *Rubus Idæus* L., then frequently planted in gardens, but now almost wholly replaced by the similar native form, *R. strigosus* Michx. The rust is the uredinial stage of *Kuehneola Uredinis* (Link) Arth., a common species on various raspberries and blackberries, but whose affinities have only been recognized within the last few years. The telial

stage is white, and the name, *Phragmidium albidum,* is often applied. Link's name of *Cæoma ruborum* belongs to another rust.

2834. 24. C. U. Potentillarum, Lk. 87, Syn. Car. 461, frequent on Potentilla canadensis, [and in] Pennsylvania.
(461. 3. [Uredo] Alchemillæ. I am certain it is the same as that on Alchemilla. Here and there on the leaves of Potentilla canadensis, living through the winter.)

Represented by a mounted packet containing loosely a bit of stem and five leaves of the host mentioned. Three of the smaller leaves show primary uredinia above, and two larger leaves show secondary uredinia beneath, the sori being numerous. An empty original packet is labelled "Cæoma (Ur) Potentillæ canadens LvS Sal & Beth."

It was quite natural for Schweinitz to think this rust was a form of Uredo Alchemillæ, both from the gross appearance of the leaves and of the sori on them, and to follow Link in placing it under the inclusive name, *C. Potentillarum.* The rust is now known to be wholly different, and is called *Frommea obtusa* (Strauss) Arth., or more commonly, *Phragmidium Potentillæ-canadensis* Diet., or *Kuehneola obtusa* (Str.) Arth.

2835. 25. C. U. Agrimoniæ L.v.S., usually wholly covering the lower surface of Agrimonia, wrongly [referred] to U. Rosæ, Syn. Car. 462.
C. spots becoming yellowish. Sori minute, confluent, spores beautifully reddish orange, finally losing their color.
(462. 4. [Uredo] Rosæ. I do not doubt that it is the same as occurs very frequently on Agrimonia Eupatoria in autumn; never on roses with us.)

Represented by three terminal leaflets, mounted, each nearly 4 cm. long, and by fragments of three compound leaves in the original packet, which is labelled "Cæoma (Ur) *Agrimoniæ* LvS Salem." All of the leaflets are abundantly covered with sori.

The rust is the characteristic uredinial stage of *Pucciniastrum Agrimoniæ* (Schw.) Tranz., which occurs in Europe and Asia, but not so common there as in America. The host appears to be *Agrimonia parviflora* Soland.

*2836. 26. C. U. Filicum, Lk. n. 101, on Aspidium, from New York, communicated by Dr. Torrey.

Represented by about 4 cm. of the terminal part of a frond, mounted, and by parts of one or more fronds of uniform appearance in the original packet, which is labelled "Cæoma Filicum Torrey Nyk in Asp. obtus," and in addition "U. polymorph in Asp. dryopt.," with a number of German localities and names of German collectors. Probably the additions to the inscription on the packet do not indicate collections, but only memoranda.

The rust occurs in rather large, covered, blistery sori, on the under surface of the fronds, and is the uredinial stage of *Hyalopsora Aspidiotus* (Peck) Magn. The host is evidently *Phegopteris Dryopteris* (L.) Fée, the *Aspidium obtusum* of Muhlenberg's "Catalogue," and the collection was probably made in the Catskill mountains, as Dr. Torrey lived for a time at West Point, N. Y. The rust is not known outside of North America. It is a mountainous form, the type collection being found by Peck in the Catskill mountains.

*2837. 27. C. U. Teucrii, L.v.S., very rare on leaves of Teucrium virginicum, Bethlehem.

C. spots obsolete. Sori densely crowded into semblance of a spot, effused, beautifully red. Spores very small, very red, almost scarlet.

Represented by one leaf, oblong, 3.5 by 7 cm., mounted, and by the empty packet, labelled inside "Uredo Teucrii in fol Teucrii canadens. Salem," and outside "Cæoma (Ured) Teucrii LvS. Naz." The leaf shows a number of rusty-looking spots, still finely purplish red, which the microscope reveals to be due to a Hyphomycetous fungus, having small oblong to linear-oblong spores, and in nowise related to the rusts, of which there are none known on *Teucrium* in America.

This material has been examined by Dr. C. L. Shear, who states that it is identical with *Cercospora racemosa* E. & M., a species founded upon a collection made by the senior author in Iowa, September 27, 1882. It is a somewhat common fungus extending from the Atlantic coast to Kansas and Nebraska. The name should be-

come, in accordance with the rules of priority, **Cercospora Teucrii** (Schw.) comb. nov.

2838. 28. C. U. Azaleæ, L.v.S., Syn. Car., 470, [as U.] minima, frequent on leaves of Azalea nudiflora, Bethlehem and Salem.

C. spots obsolete. Sori on the lower surface, at first somewhat cone shaped, minute, orange, finally effused. Spores very minute, losing their color, and unequal, pyriform, with globose forms intermixed.

(470. 12. [Uredo] minima Sz.

U. very minute, punctiform, pale orange, sparse, peridia subconic.

Frequent on the lower surface of the leaves of Azalea nudiflora.)

Represented by a mounted leaf 2 by 6 cm., thickly covered on the lower surface with uredinia corresponding to the description, and by an empty packet labelled inside "Uredo farinosa β minima in Azalea nudif Salem," together with the later name "Cæoma minimum," written above, and on the outside "Cæoma (Ur) *Azaleæ* LvS. Beth & Sal."

The rust is the uredinial stage of *Pucciniastrum minimum* (Schw.) Arth., as reported in the "North American Flora" 7: 109. 1907, a name now believed to be synonymous with *P. Myrtilli* (Schum.) Arth., a rust occurring upon various species of *Vaccinium,* as well as on *Azalea nudiflora* L., and other Ericaceous hosts.

3. *Fuscentes and Nigredines* (Browns and Blacks).

2839. 29. C. U. Ari virginici, L.v.S., Syn. Car., [as U.] Caladii, 480, Lk. n. 21. It is not Caladium but Arum on which this is frequently found and in Pennsylvania.

(480. 22. [Uredo] Caladii Sz.

U. punctiform, solitary, seated on large yellowish spots, the spore-mass fuscous.

Frequent on the under side of the leaves of Caladium. Peridia at first closed, at length scattering the spores.)

Represented by a 3 cm. square portion, cut from a large leaf, mounted, showing uredinia scattered over the surface, and by an empty packet labelled inside "Uredo Caladii Salem," and outside "*Cæoma Ari virginici* LvS. n. Caladii Salem."

The rust is the uredinial stage of *Uromyces Caladii* (Schw.) Farl., the æcial stage being given under nos. 2860 and 2861, and the telial stage under no. 2946. Doubtless Schweinitz was right in thinking the host to be *Arum virginicum* L., now known as *Peltandra virginica* (L.) Kunth, and not *Caladium* [*sagittifolium* Nutt.], although the fact can not now be verified. Both hosts occur in North Carolina, but only the former in Pennsylvania.

2840. 30. C. U. Spermacoces L.v.S., Syn. Car., [under] Puccinia, 502, Lk. n. 57, elegant. Spores not septate, and Philadelphia.

(502. 17. [Puccinia] Spermacoces Sz.

P. subquadrate, dark chestnut-brown, spores globose, simple, pedicel very long, filiform.

Frequent on leaves and stems of Spermacoce. Breaks through the epidermis in the form of a square. Spores fuscous, irregularly globose, pointed or blunt, without septum. Pedicel ten times longer, hyaline. By pressure the epidermis is separated from the square mass as a continuous membrane in which a cellular structure is not to be seen under lenses having a focus of half a line, and a very thin vesicular substance escapes.)

Represented by two small fragments of stem with leaves and fruit, placed loose in a mounted packet. The original empty packet is labelled inside "Dicæoma Spermacocis Salem," and on the outside "Cæoma Spermacocis LvS. Sal."

The rust is chiefly the telial stage of *Uromyces Spermacoces* (Schw.) M. A. Curt., common throughout the southern states, and the host is undoubtedly *Diodia teres* Walt. (*Spermacoce diodina* Michx.).

It is interesting to trace the change in view, in the interim between the publication of the two papers, regarding the systematic position of forms with dark teliospores, which we would now call *Uromyces*. In the North Carolina paper of 1822 Schweinitz divided the genus *Puccinia* into "*A*, spores distinctly bilocular," and "*B*, spores globose with septum inconspicuous," evidently following the example of DeCandolle in the *Flore Francaise* (2:224) of 1805. Under the latter division Schweinitz placed two species of *Uromyces*, with the septum described as absent or not conspicuous, respectively. Evidently there was a feeling that these forms with an uncertain septum and globoid spore belonged with those species of

Puccinia having elongated spores and an evident septum. Later the idea of a possible septum was abandoned, and it was necessary to place these dark, globoid, non-septate forms under the all-inclusive genus *Uredo,* in spite of their apparent relationship to *Puccinia.* Still later systematists placed them in the genus *Uromyces,* but recently the opinion has been growing that the earlier method of DeCandolle and Schweinitz better indicates their true relationship.

The mention of the kind of lens used in these studies helps to explain why the question of the presence of a septum should have remained uncertain. Even without knowing the degree of definition, doubtless far less than that of modern hand lenses, it is clear that the magnification left much to be desired.

*2841. 31. C. U. Chærophylli, L.v.S., on leaves of Chærophyllum or Myrrhis Claytoni, Pennsylvania.
C. spots obsolete: sori rounded, sparse and aggregated, even somewhat confluent, finally uncovered by rupturing the epidermis. Spores effused, globose, from tobacco-like to black, shining.

Represented by a compound leaf of three leaflets, each about 3 cm. long, mounted, showing uredinia and telia, and an empty packet, labelled inside "Uredo chærophylli, N. Beth Detwyler," and outside "Cæoma (Ur) chærophylli LvS prope Beth Detwyler."

The rust proves to be *Puccinia Pimpinellæ* (Str.) Mart. (*P. Osmorrhizæ* C. & P.), and the host to be *Osmorrhiza,* in all probability *O. Claytoni* (Michx.) Clarke (*Myrrhis Claytoni* Michx.), as suggested by Schweinitz. The material is essentially identical with that of nos. 2829 and 2851.

*2842. 32. C. U. Hyperici, L.v.S., on stems of an unidentified Hypericum rare in Carolina; not the same with C. hypericorum, Lk.
C. spots on the pilose-strigose stem, purple: sori sparse, acuminate-ovate, bullate, elevated, surrounded by the ruptured epidermis. Spores fuscous purple, becoming effused.

Represented by a much branched stem, without leaves, but with eleven seed pods, mounted, having uredinia sparingly distributed over the stem, and by an empty packet labelled "Cæoma (Ur) *Hyperici* LvS. Salem."

The rust is the uredinial stage of *Uromyces Hyperici-frondosi* (Schw.) Arth., and the host is some species of *Hypericum,* not yet identified, but which doubtless can be. Schweinitz was right in thinking his material quite different from *Cæoma hypericorum* Link, which belongs under the genus *Melampsora.*

2843. 33. C. U. Heucheræ, L.v.S., Lk. 79, Syn. Car. 479, not in Pennsylvania.
(479. 21. [Uredo] Heucheræ Sz.
U. seated on orbicular, yellowish spots, peridia subconcentric, crowded, dark chestnut brown, spore mass dark fuscous.
Here and there on the leaves of Heuchera Americana and villosa. Peridia at first closed; at length scattering the spores, minute. Related to U. Anemones.)

Represented by part, about 4 by 5 cm., of a large leaf, mounted, having small, hypophyllous, pulvinate, brown sori, and by an empty packet labelled inside "Uredo Tiarellæ Heucheræ Salem," and on outside "Cæoma (Ur) *Heucheræ* LvS. Salem."

The spores are oblong, two-celled, and smooth whether examined wet or dry. The rust is now called *Puccinia Heucheræ* (Schw.) Dietel. The mounted leaf appears to be that of *Heuchera americana* L., but the rust is known to occur on many species, and may well have been seen by Schweinitz on *H. villosa* Michx.

The systematic position of the species must have been determined by Schweinitz from the gross appearance alone. This would account for its inclusion in the subgenus *Uredo,* and for the omission of spore characters in the description.

*2844. 34. C. U. apiculosum, Lk. [n. not] p. 90, on Phaseolus, Bethlehem, Syn. Car. 478.
(478. 20. [Uredo] flosculosorum. Conspect. fung. On Kuhnia, Eupatorium, and other composites. (Cæomurus Link.))

No specimen or packet remains to represent this number. Two typographical errors occur in the entry. The asterisk should be omitted, and the reference to Link's work should read n. 90, and not "p. 90," the reference being to the number of the species and not to the page.

The name *Uredo flosculosorum* was established by Albertini and Schweinitz (Consp. Fung. Nisk. 128) and they named as hosts

Prenanthes, Leontodon and *Hieracium,* all Cichoriaceous composites, while here Schweinitz has extended the use of the name to Carduaceous composites, and even legumes. Link at the place cited reduced this name to a synonym, together with twenty-two others, under his inclusive species, *C. apiculosum.* The species has no value in the modern sense, being a concept supported only by superficial characters, and represented by an incongruous mixture of species.

2845. 35. C. U. appendiculosum, Lk. 91, Syn. Car. 477, and Bethlehem. (477. 19. [Uredo] appendiculata. Common on Phaseolus and on Pisum sativum. (Cæomurus.))

A record in the North Carolina list that is not accounted for in the later one may be entered here, as it is the same rust, although placed by Schweinitz under *Puccinia* and erroneously referred to a name belonging to another species of rust.

(490. 5. [Puccinia] Avicularіæ *ββ* Fabæ. Not infrequent on Phaseolus.)

Represented by a mounted packet loosely containing three leaflets of the garden bean (*Phascolus vulgaris* L.) and two leaflets of garden pea, while the original packet labelled "Cæoma (Ured) appendiculos Beth," has one leaflet of bean and two of pea. The bean leaflets are well covered beneath with uredinia. The pea leaflets are discolored with spots but have no rust; furthermore, no rust has ever been found in America on the garden pea, *Pisum sativum.* Schweinitz mistook the spots for a common European rust, which he naturally expected to find under the same conditions here as in Europe.

The rust on the leaflets of *Phaseolus,* the common bean, is *Uromyces appendiculatus* (Pers.) *Fries.* The European rust on *Pisum* is a different species. The specimen preserved doubtless represents no. 477 of the Carolina list, showing the uredinial stage of the rust, while no. 490 of the same list is unrepresented by a collection, and as it was placed under *Puccinia,* doubtless had reference to the telial stage of the same rust.

2846. 36. C. U. punctuosum, Lk. 93, Syn. Car. 474, [as U.] scutellata, also Bethlehem on Euphorbia hypericifolia.
(474. 16. [Uredo] scutellata. More or less frequent on Euphorbia hypericifolia.)

Schweinitz had an entry in his Carolina list, which is nowhere referred to in the later one. It can be entered here, as it is the same rust, although he placed it under his section "Rubigo."

(459. 1. [Uredo] Euphorbiæ. Not rare on leaves of Euphorbia maculata.)

Represented by some four pieces of branched stem about 3 cm. long, with leaves, more or less fragmentary, inflorescence and mature seeds, showing a few, scattered uredinia, placed loose in a mounted packet, and by an original packet, containing a few similar fragments, labelled "Cæoma (Ured) punctuos in Euphorb hypericif Beth." Another original packet containing fragments of branched stems about 2 cm. long, with leaves and inflorescence, but not mature seeds, was first labelled "Cæoma (Ur) *Euphorbiæ hypericif* non scutellat Sal & Bet," then the specific name was cancelled and "punctosum" substituted. The latter packet doubtless represents the Salem collection and the former one the collection from Bethlehem. There is no material or packet for the collection on *E. maculata.*

The rust is *Uromyces proëminens* (DC.) Pass., showing varying proportions of uredinia and telia. In the interim between his two lists Schweinitz had ascertained that the European name used in his earlier list, *"U. scutellata,"* applied to another rust which he had not found in America. The hosts are *Chamæsyce Preslii* (Guss.) Arth. (*Euphorbia Preslii* Guss., *E. hypericifolia* having recently been ascertained to be a more southern species) and *Chamæsyce maculata* (L.) Small (*Euphorbia maculata* L.).

2847. 37. C. U. Leguminosarum, Lk. 92, Syn. Car. 476, [as U.] Viciæ, on Vicia Faba, Bethlehem and Salem.
(476. 18. [Uredo] Viciæ. Fabæ. On the stems of Vicia Faba.

There is no mounted specimen or original packet to represent these entries.

If a rust were really present, as there may have been, it was *Uromyces Fabæ* (Pers.) DeBary, which is occasionally found on the English bean, *V. Faba,* in America, but is more common on native species of *Vicia* and *Lathyrus.*

*2848. 38. C. U. Lobeliæ cardinalis, L.v.S., rather rare on the under surface of leaves of Lobelia cardinalis, Nazareth.
C. spots obsolete, sori effused-confluent, not elevated, or surrounded by the epidermis. Spores effused, pedicelled, chocolate-purplish.

Represented by a lanceolate, serrate leaf, about 6 cm. long, and 1.5 cm. wide, mounted, and by an empty packet labelled on the inside "Uredo Lobeliæ cardinal," and on the outside "Cæoma (Ured) *Lobeliæ Cardinal* LvS. Beth."

The leaf is well covered with a brown effused growth due to a Hyphomycetous fungus, *Cercospora effusa* (B. & C.) E. & E.

*2849. 39. C. U. Thalictri, L.v.S., very rare but beautiful, on leaves of Thalictrum cornuti, Bethlehem.
C. spots none. Sori pulvinate, roundish—a line or more in diameter, widely aggregated, somewhat surrounded by the epidermis. Spores rather large, and from chocolate to fuscous.

Represented by part of a leaf, 1.5 by 2 cm., mounted, and by an empty packet labelled "Cæoma (Ured) *Thalictri* LvS. Naz."

The leaf is thickly and evenly covered with round, brown sori, bearing 2-celled, and a few 1-celled, teliospores of the characteristic form belonging to *Polythelis Thalictri* (Chev.) Arth. (*Puccinia Thalictri* Chev.), on *Thalictrum polygamum* Muhl. (*T. Cornuti* Auct.).

*2850. 40. C. U. brunneum, L.v.S., on leaves of an unknown plant from the collection of Mr. Collins, Philadelphia.
C. spots yellowish, on the upper surface of the leaf. Sori applanate, irregular in form, variously confluent. Spores minute, brown-fuscous, at first conglutinate.

Represented by an oblong leaflet, about 3.5 cm. long, apparently leguminous, mounted, and by an empty packet labelled "Cæoma (Ured) *brunea* in fol exot Collins."

The leaf bears reddish-brown spots on the upper surface, their

origin being obscure. The microscope shows no evidence of mycelium, and the spots are probably not due to a fungus. This conclusion has been confirmed by Dr. C. L. Shear of Washington, D. C.

*2851. 41. C. U. Chelidonii, L.v.S., very rare. On leaves of Chelidonium sent from New York.
C. spots yellowish. Sori irregular in form, clustered, confluent. Spores rather large, fuscous and black, oval, loosely scattered.

Represented by an angularly ovate leaf, incised, 3 by 5 cm., having characteristic white hairs, especially on the veins, mounted, and by an empty packet labelled inside "Uredo *Chelidonii* Halsey NYk," and outside "Cæoma (Ured) *Chelidonii* LvS NewYk Halsey."

The error in mistaking *Osmorrhiza* for *Chelidonium* was pointed out by Dr. W. G. Farlow in the preface to his "Host Index of Fungi," 1888.

The mounted fragment of leaf bears two small groups of brown sori on the under surface, rather pulverulent, having both uredinio-spores and teliospores present, identical with *Puccinia Pimpinellæ* (Str.) Mart. (*P. Osmorrhizæ* C. & P.), and essentially the same as nos. 2829 and 2841. It is a curious result of too credulously accepting the first impression of the identity of a host that led Schweinitz three times to describe the same rust from the same host, as if representing three independent species on three wholly unlike and unrelated hosts.

4. *Albugo.*

Note.—Two numbers are given under this heading, both true representatives of the accepted Phycomycetous genus *Albugo,* and they are, therefore, omitted here.

5. *Sporidiis inæqualibus* (spores unequal).

*2854. 44. C. U. gyrosum, Lk. 105, on leaves of Rubus Idæus, Bethlehem.

Represented neither by specimen nor packet. There is, however, an original packet labelled "Cæoma (Ur) gyrosa Reb. in Rub Id. Kunze," and a similar one in the Herb. Curtis at Harvard University. This collection shows a few small fragments of raspberry

leaves, bearing pycnia and æcia of a *Phragmidium* on their upper surface. It is possible that this European material represents the entry, inadvertently made for North America. It seems more probable that Schweinitz found a rust at Bethlehem, which he considered the same, but for which there is now no specimen. If so, the host was probably the European red raspberry, at that time much cultivated in American gardens. In that case the rust may have been the æcial stage of *Phragmidium imitans* Arth., although Schweinitz nowhere records the more striking telial stage. The exact status of the record necessarily remains uncertain.

*2855. 45. C. U. cylindricum, Lk. 108, on Populus italica, Bethlehem.

Represented by a 5 cm. square portion, cut from a large, firm leaf, mounted, and by a few small fragments in the original packet, which is labelled "Cæoma (Ur.) cylindrica *populina* Bet."

The fragments of leaf are well besprinkled with uredinia, and the microscopic examination shows essential similarity to the uredinial stage of *Melampsora Medusæ* Thüm., the common American rust on various species of *Populus*. The host may well be the Lombardy poplar (*Populus dilatata* Ait.), as stated, although no other collection on this host has come to hand.

*2856. 46. C. U. epiteum, Lk. 112, on leaves of Salix nigra, over nearly the whole tree, Bethlehem.

Represented by two short stems with respectively two and three attached leaves and three unattached leaves placed loosely in a mounted packet, and by small fragments of a young stem and leaves in the original packet, which was at first labelled "Uredo epiteum in Salici nigri Beth," then the word "epiteum" crossed out and "Saliceti" substituted, and afterward the first wording restored. All the leaves are covered beneath rather sparingly with uredinia.

The collection is the first to be recorded for the very common American form on various willows, *Melampsora Bigelowii* Thüm. The spores are noticeably small and thin-walled for the species. The willow rusts are yet imperfectly understood. The host is clearly *Salix nigra* Marsh.

β. Subgenus ÆCIDIUM.

*2857. 47. C. A. Convallariatum, Lk. 114, on leaves of Smilacina racemosa, Bethlehem, very rare.

Represented by a mounted specimen of the middle part 4.5 cm. long, of a 2.5 cm. wide leaf, bearing beneath about ten small groups of circinating æcia, and by an empty packet labelled "Æcid *Convallariatum* Salem."

The rust is an heteræcious form, without doubt, and is usually considered to be the æcial stage of *Puccinia Majanthæ* (Schum.) A. & H., occurring in both Europe and America on *Phalaris* and other grasses, but the genetic connection has not been fully established for the American material.

We must assume that "Salem" on the original packet was an error for "Bethl," in view of the printed record, which is starred and does not mention Salem.

The host was doubtless as stated, *Vagnera racemosa* (L.) Morong (*Smilacina racemosa* Desf.)

2858. 48. C. A. Uvulariatum, L.v.S., Syn. Car. 453, hardly C. Alliatum as referred by Link, n. 116, for it differs in having spots rather small, never exceeding a fourth of an inch, also in being white.

(453. 24. [Æcidium] Uvulariæ Sz.

A. orbicular, white, delicate, peridia excentric, circinate, white, spore-mass white.

Here and there on the leaves of Uvularia perfoliata. Peridia crowded in concentric circles, none in the center itself. Similar to A. Allii ursini, but the color in that is yellowish.)

Represented by the proximal half of two perfoliate leaves attached to the 2.5 cm. stem, mounted, one of the leaves bearing a single, rather diffused group of æcia, and also by an empty packet, labelled on the inside "Æcidium circinatum Rhlg In Uvularia perfol & Polygonatum Salem," and on the outside "Æcidium Uvulariatum LvS. Salem."

This rust has the same uncertain status as the preceding one, but is generally considered the æcial stage of *Puccinia Majanthæ* (Schum.) Arth. Schweinitz's name was changed on p. 309 of his later work to *Æcidium* (*Cæoma*) *uvulariatum*.

2859. 49. C. A. Smilacinatum, L.v.S., Syn. Car. 452, Lk. 117, not yet met with in Pennsylvania.

(452. 23. [Æcidium] Smilacis Sz.

A. wart-like, convex below, concave above, yellow-red, peridia copious, spores white.

Here and there on leaves of Smilax rotundifolia and laurifolia. Very distinct. Making thick, conic-cylindric warts on the under side of the leaf. These warts are somewhat truncate and on the pulvinate-truncate part covered with sunken peridia, two lines to a quarter of an inch wide and two or three lines high. Spores white, rather large, oval, vesicular.)

Represented by a nearly round leaf, 5 cm. in diameter, mounted, bearing one group of æcia, and by an empty packet labelled inside "Æcidium Smilacis In S. rotundifol & al Salem." with the addition "Cæoma Smilacinatum," and on the outside "Æcidium *Smilacinatum* LvS Salem."

This is the æcial stage of *Puccinia Smilacis* Schw., a rust that is widely distributed in the southern states, and tropical America. The æcia are rarely collected, and so far have been reported only from North and South Carolina. The name was changed by Schweinitz to *Æcidium* (*Cæoma*) *smilacinatum* on page 309 of his later work.

2860. 50. C. A. Aroidatum, L.v.S., Syn. Car. 457, [as A.] Caladii, on Arum virginicum, Salem.

(457. 28. [Æcidium] Caladii Sz.

A. simple, on very extended areas, peridia rufous-yellow, sphæriaform, spore-mass orange.

Frequent in some years on the midrib of the leaves and the stems of Caladium sagittæfolium; it kills the plants. The closed peridia resemble Sphærias).

Represented by the middle part, 3 cm. long, of a 5 cm. wide leaf, with over-mature æcia along midrib and large veins, now eaten by insects, and by an empty packet labelled inside "Æcidium Caladii In Calad. Salem," with the later addition "Cæoma aroidatum," and on the outside "Æcidium Caladiatum LvS. Salem," with the subsequent addition "Aroidat."

This is the æcial stage of *Uromyces Caladii* (Schw.) Farl., and on *Peltandra virginica* (L.) Kunth (*Arum virginicum* L.), see also no. 2839. The name *Cæoma Aroidatum* should have been credited

to Link, n. 118. Schweinitz changed the name to *Æcidium* (*Cœoma*) *aroidatum* on page 309 of his later work.

*2861. 51. C. A. Dracontionatum, L.v.S., frequent on leaves and petioles, and also on the scapes of Arum dracontium, Bethlehem. Not the same as the preceding. Also Salem.

C. spots pale, widely scattered over the leaf, occupying nearly the whole of it. Pseudoperidia large, scattered irregularly in dense clusters on the spot. Spores orange color.

Represented by a much broken leaf, 3 by 5 cm., mounted, thickly covered beneath with large æcia, and by a packet labelled inside "Æcidium Dracontii In Aro Dracont Salem," and on the outside "Æcidium *Dracontiatum* LvS Salem," containing a few very small fragments of leaf, showing æcia.

The differences noted by Schweinitz between this collection and the preceding one are now ascribed to the influence of the host, and the form is referred to *Uromyces Caladii* (Schw.) Farl, the host being *Muricauda Dracontium* (L.) Small (*Arum Dracontium* L., *Arisæma Dracontium* Schott.). The name of the rust was changed to *Æcidium* (*Cœoma*) *dracontionatum* on page 309 of his later work.

*2862. 52. C. A. rubellatum, Lk. n. 120, rather rare on various species of Rumex, Salem and Bethlehem. Spots generally sterile.

It is evident that Schweinitz should have cited here the following similar entry in his North Carolina list, and have omitted the asterisk.

(433. 4. [Æcidium] Rumicis. Frequently seen as spots on Rumex and Grossularia; but the fungus is very rarely perfect.)

No specimen or packet remains to represent these records nor is there any in the Herb. Curtis at Harvard University. Both entries are without doubt founded upon errors of observation. *Rumex* leaves are often spotted from the action of fungi imperfecti which could easily be mistaken for the small æcia not uncommon on this host in Europe. The mention of *Grossularia* was doubtless in conformity with Persoon, who thus associates these hosts.

2863. 53. C. A. Lysimachiatum, Lk. 126, Syn. Car. 438, absolutely the same. In Pennsylvania, generally on L. racemosa.

(438. 9. [Ædidium] Lysimachiæ Sz.

A. diffuse, pale, rather small, epiphyllous, peridia crowded, dentate, spore-mass somewhat flesh colored.

On leaves of Lysimachia quadrifolia and stricta, unless perchance two species exist; for the one on quadrifolia is not pale, but tinged with a red color. It makes a rather small spot on the upper surface of the leaves.)

Represented by a somewhat torn leaf, 1.5 by 4 cm., bearing beneath a rather diffuse, compound group of old æcia, and by an empty packet labelled inside "Ædidium Lysimachiæ in L. quadrifol Sal," and on the outside "Ædidium Lysimachiatum in L. quadrif. Salem."

Schweinitz's statement, "absolutely the same," doubtless refers to a note in Link's work as to the identity of American and European material, which mycologists still hold in general with Schweinitz to be one, although Link was too uncertain about the matter to accept Schweinitz's name as a basis or even as a synonym of his *C. Lysimachiatum,* founded upon Schlechtendahl's *C. Lysimachiæ,* which was published two years later than Schweinitz's name. The fungus is now accounted the æcial stage of the *Carex* rust, usually called *Puccinia limosæ* Magn., a widely scattered but rather local species, recently given the name *P. lysimachiata* (Link) Kern, there being already a *P. Lysimachiæ* of Karsten, 1879.

Both spot and æcia on the mounted leaf still appear reddish, as stated by Schweinitz for *L. quadrifolia.* The two names, *L. stricta* Ait. and *L. racemosa* Lam., are now considered synonyms of *L. terrestris* (L.) B. S. P.

2864. 54. C. A. Pentstemoniatum, L.v.S., Syn. Car. 449, Lk. p. 47, only observed in Carolina.

(449. 20. [Ædidium] Pentastemonis Sz.

A. orbicular, rather small, dense, purple, yellow beneath, peridia white, congested.

Not infrequent on leaves and stems of Pentastemon hirsutus. Distinct species. Two lines broad. Peridia large for the size of the plants. Spores yellow-brown, simple, vericulose.)

Represented by an original packet, containing three fragmentary

leaves and a small portion of a stem, now in rather poor condition, and showing only a few æcia on one of the leaves, labelled inside "Æcidium Pentstemonitis Salem," and on the outside "Æcidium *Pentstemoniat* LvS Salem." Although there is no mounted specimen there are pin marks where one may have been attached.

The rust is common in the eastern United States, and is the æcial stage of no. 2911, *Puccinia Andropogonis* Schw., as proven by cultures first made by the senior author in 1899 (*Bot. Gaz.*, 29:272), and subsequently repeated a number of times. The southern *Pentstemon*, corresponding to the northern *P. hirsutus*, is *P. australis* Small. Schweinitz changed the name of the rust to *Æcidium* (*Cæoma*) *pentstemoniatum* on page 309 of his later work.

2865. 55. C. A. Apocynatum, L.v.S., Syn. Car. 448, Lk. n. 135, not yet [seen] in Pennsylvania.

(448. 19. [Æcidium] Apocyni Sz.

A. orbicular, very large, orange, pale below. Peridia arranged in a few concentric circles, somewhat fuscous.

On leaves of Apocynum cannabinum in the mountains. Spots delicate. Peridia when closed from yellow to chestnut-brown or somewhat fuscous, when open with a pale, lacerate margin. Spores simple, white.)

Represented by a mounted specimen of the middle part, 4 cm. long, of a 3.5 cm. wide leaf, bearing beneath two groups of æcia, centrally placed on dark spots 7 mm. across, and by a packet containing a small part of a leaf, showing no fungus, and labelled "Æcidium *Apocyniatum* in Apocyn. pubes. Salem."

This rust is not much better understood than in the days of Schweinitz. Only six other collections are known to the writers, which have come from Delaware, New Jersey, District of Columbia and North Carolina. It is probably a heterœcious form, but no suggestion has been made regarding the alternate host. The name was written *Æcidium* (*Cæoma*) *apocynatum* by Schweinitz on page 309 of his later work.

2866. 56. C. A. Convolvulatum, L.v.S., Syn. Car. 454, very frequent also in Pennsylvania on C. panduratus.

(454. '25. [Æcidium] Ipomœæ-panduranæ Sz.

A. very large, bullate, depressed above, white, peridia flexuose, rather large, elevated, ruptured by a slit, spore-mass cinereous-golden-red.

Frequent on the leaves of Ipomœa (Convolv.) pandurana. Peridia thick, the loose epidermis larger than in almost any Ædicia, except cornutum and cancellatum. Spores rather small, oblong.)

Represented by a mounted stem, 7 cm. long, and part of two leaves, and by an original packet, containing ample material, and labelled inside "Ædicium Ipomææ in pandurata & lacunosa Salem," and on the outside "Ædicium Convulvuliat LvS. Salem & Beth in Conv. pandurat."

The fungus is certainly and wholly *Albugo Ipomœæ-panduranæ* (Schw.) Swingle one of the Peronosporales, and not a rust. The name was changed to *Ædicium* (*Cœoma*) *convolvulatum* at page 309 of the later work.

2867. 57. C. A. Compositarum, Lk. n. 139, and frequent in Pennsylvania.
α Prenanthis on Krigia, Salem, Syn. Car. 434.
β Eupatoriæ, Bethlehem, frequent on E. purpureum.
(434. 5. [Ædicium] Dandelionis Sz.
Why not merely a variety of Ædicium prenanthis, to which it is very similar? Spores subglobose, without septum and pedicel, chestnut-brown. On leaves and stems of Tragopogon Dandelion. Rare.)

Represented by an original packet, containing a few very small fragments of a leaf with many æcia, and labelled inside "Ædicium Eupatoriæ maculatæ Bethl," and on the outside "Ædicium *Eupatoriatum* LvS Beth," with "compositatum" written above. There is no packet for the other entry, and no mounted material for either, although there is indication that there may once have been a mount where pin marks now show.

The æcia on *Eupatorium* are doubtless to be assigned to the widespread rust, *Puccinia Eleocharidis* Arth., very common both north and south, the uredinia and telia being on various species of *Eleocharis,* and the æcia on various species of *Eupatorium,* including both *E. maculatum* L. and *E. purpureum* L. As the fragment in the original packet shows the leaf to be smooth above with minute sparse pubescence beneath and not at all scabrous, the host is doubtless *E. purpureum* and not *E. maculatum,* the conclusion evidently reached by Schweinitz.

The identity of the form on *Krigia* is somewhat uncertain. The

color of the spores fits well the uredinia of *Puccinia Pyrrhopappi* Syd. (*P. Krigiæ* Syd.), the only known collection on *Krigia* having been made by Dr. B. L. Robinson at Asheville, N. C., Aug. 2, 1893, on *K. virginica* Willd. But that form of rust has scattered sori, and not clustered as in an *Æcidium*. Schweinitz thought the fungus not unlike *Æcidium Prenanthis* Pers., and fortunately there is a specimen of this species in the Schweinitz collection, which had been received from Kunze. It consists of a smooth, thin, deltoid leaf, some 5 or 6 cm. across, which bore a single cluster of æcia, most of which has now disappeared. It is clear, nevertheless, that Schweinitz must have had an æcidioid fungus on the *Krigia*. The only known form on *Krigia* with clustered sori having "chestnut-brown" spores is that of the short-cycle species which at another time and on another host Schweinitz called *Puccinia maculosa* (see no. 2922). The teliospores germinate at maturity in the sorus, and placing some of them under such magnification as Schweinitz probably used, gives the appearance of "spores subglobose, without septum and pedicel."

The host was well known to the contemporaries of Schweinitz, and commonly called the "small dandelion" (see Muhlenberg's Catalogue, p. 71). It was considered closely related to *Prenanthes*. The latest form of the name is *Adopogon Dandelion* (L.) Kuntze.

*2868. 58. C. A. Hieraciatum, L.v.S., here and there on the leaves of H. paniculatum and maculatum, Bethlehem.
C. spots deep purple, widely effused. Pseudoperidia circinate, on the center of the spot, margins beautifully fimbriate, spores orange.

Represented by 5.5 cm. of a lanceolate leaf, 2 cm. wide, denticulate, slightly pubescent beneath, having two groups of æcia, and by an empty packet labelled "Æcidium *hieraciatum* Lv Hieracii paniculat Beth."

The host is correctly named, for the leaf exactly matches the leaves of a phanerogamic specimen collected by Schweinitz at Salem, N. C., now in the herbarium of the Philadelphia Academy, which is without question *H. paniculatum*.

The name of the rust was changed by Schweinitz to *Æcidium* (*Cæoma*) *hieraciatum* on page 309 of the same work. The rust is

undoubtedly identical with a widespread species, having telia on *Carex* and æcia on many Cichoriaceous hosts, but it has not been reported by any other collector on *Hieracium paniculatum.* The species has generally been called *Puccinia patruelis* Arth., but Schweinitz's specific name is much older and should therefore be used, making the name **P. hieraciata** (Schw.) comb. nov. No other collections of *P. hieraciata,* either of æcial or telial stages, are known with certainty east of Michigan and Indiana, but it is not improbable that the species occurs sparingly in the eastern mountains.

*2869. 59. C. A. Erigeronatum, L.v.S., rather rare but ample on E. heterophyllus, Bethlehem.

C. spots very large, yellowish, rather thick. Pseudoperidia dènsely and irregularly scattered, elevated. Spores yellowish.

Represented by the major part, 5.5 cm. in length, of two leaves, 2 and 3 cm. broad respectively, the smaller showing four groups of æcia, and the larger many æcia thickly and evenly grouped over an area 2.5 cm. across, and also by an empty packet labelled inside "Æcidium Flosculosorum Salem," later added below "in Solidago, Erigeron, Aster," and still later added above "Cæoma asteratum," and finally "erigeronatum," and also labelled on the outside "Æcidium compositat *Erigeronatum* LvS Bethl."

The host, which has been compared with phanerogamic specimens, is certainly *Erigeron annuus* Pers. (*E. heterophyllus* Muhl.), and the rust is the common one on this host, being the æcial stage of *Puccinia Asterum* (Schw.) Kern, and belonging to the physiological race represented by the name *Puccinia Caricis-Erigerontis* Arth., as proven by cultures. Schweinitz changed his name to *Æcidium* (*Cæoma*) *erigeronatum* on page 309 of the same work.

2870. 60. C. A. Asteratum, L.v.S., Syn. Car. 444, Lk. 143, common, especially on A. paniculatus. Link does well to join with this C. Solidaginis, Syn. Car. 446, and C. Verbesinæ, 445. But C. Helianthi does not belong here.

(444. 15. [Æcidium] Asterum Sz.

A. effuse, confluent, very delicate, pale, purplish, peridia aggregated, immersed, spore-mass white.

Here and there on leaves and stems of smooth leaved Asters.—Spores rather large, vescicular, globose or oblong, simple.)

(445. 16. [Æcidium] Verbesinæ Sz.

A. oval, rather thick, small, pale reddish yellow, peridia few, prominent, white.

Frequent on Verbesina, Sigesbeckia, and others. Spots four lines in diameter. Spores simple, very small, pale, margins of the peridia entire.)

(446. 17. [Æcidium] Solidaginis Sz.

A. effuse, rather large, peridia scattered, minute.

Frequent on stems of Solidagos before flowering. Similar to the preceding.)

Neither specimens nor packets remain to represent these entries. Schweinitz was right in putting the *Solidago* æcia with those on *Aster*. They go with the *Aster-Solidago-Erigeron-Carex* combination lately passing under the name, *Puccinia extensicola* Plowr., along with the preceding number, one belonging to the physiological race, *Puccinia Caricis-Asteris,* and the other to that of *P. Caricis-Solidaginis* as abundantly indicated by cultures. The present accepted name is *Puccinia Asterum* (Schw.) Kern.

He was also right in excluding *A. Helianthi-mollis,* here given under the subsequent number; but he was wrong in retaining *A. Verbesinæ*. The *Verbesina* æcia belong with the autœcious rust *Puccinia Verbesinæ* Schw. (see no. 2925), a rust which is common throughout the southern states. All collections of this species appear to be on *V. occidentalis* (L.) Walt., which doubtless was the host of Schweinitz's no. 445. No rust has yet come to hand on *Siegesbeckia* (*Actinomeris*), and the inclusion of the name must have been due to an assumption not supported by collections. Schweinitz claimed authorship of this species, hence places his initials after the name, although Link was the first to write it in this form, as Schweinitz was well aware. The name was written by Schweinitz *Æcidium* (*Cœoma*) *asteratum* on page 309 of his later work.

2871. 61. C. A. Helianthatum, L.v.S., Syn. Car. 450, frequent on H. mollis. Rare in Pennsylvania.

(450. 21. [Æcidium] Helianthi mollis Sz.

A. oblong, thick, whitish, peridia congested, pale, spores oblong.

Frequent on the under side of the leaves of Helianthus mollis;

hairy. Spores under the microscope yellow-fuscous, vesicular; when old pellucid, white.)

Represented by a lanceolate, very tomentose leaf, 4.5 cm. long, and part of another similar leaf, both mounted, showing small groups of æcia. An empty packet is labelled inside "Æcidium Helianthi mollis Salem," and outside "Æcidium *helianthatum* LvS. on Helianthi molli Salem."

The name was changed by Schweinitz to *Æcidium* (*Cæoma*) *helianthatum* on page 309 of his later work. This collection represents the basis for the earliest name to be applied to any part of the cycle of the American sunflower rust which is generally called *Puccinia Helianthi* Schw. A less convenient, but technically more correct name, therefore, is **P. Helianthi-mollis** (Schw.) comb. nov.

*2872. 62. C. A. Trachelifoliatum, L.v.S., here and there on the leaves of Helianthus trachelifolius, Bethlehem.

C. spots broadly effuse, yellowish or rufous, confluent, large. Pseudoperidia very densely aggregated in the center, as if crowded and appressed to each other, and hence somewhat angular, moderately elevated; margin not fimbriate. Spores yellow, finally decolored.

Represented by parts of two originally large leaves, 3 and 4 cm. broad respectively, mounted, and by three broken leaves and many fragments in the original packet, which is labeled "Æcidium Helianthi trachelif." The leaves bear a number of groups of æcia.

The fungus is the æcial stage of the common sunflower rust, *Puccinia Helianthi-mollis*, and the host, so far as the specimen shows, is as given by Schweinitz. The name was changed by Schweinitz to *Æcidium* (*Cæoma*) *trachelifoliatum* on page 309 of the same work.

*2873. 63. C. A. Gnaphaliatum, L.v.S., striking and very common in the late autumn on leaves (under side), also on the woolly stems of Gnaphalium polycephalum, Bethlehem.

C. hypophyllous, at first cloaked in the wool of the leaves and stems. Spots more or less effuse, yellowish. Pseudoperidia only a few, but densely approximate, very often even single, very long, and very white, cylindric, apex fimbriate. Spores orange yellow. It is related to C. Pini in the form of the peridium.

Represented by two stems, each 6 cm. long, and many crumpled

leaves, loose in a mounted packet, and by two original packets, one containing a stem 12 cm. long, and a few leaves, labelled "Æcidium Gnaphalites LvS 1828," and another containing a few leaves labelled "Cæoma Æcidium *Gnaphalitum* LvS. spec. exim." The collection shows a few æcia.

The host is without doubt *G. obtusifolium* L. (*G. polycephalum* Michx.), and the rust is the æcial form of what has commonly been called *Puccinia investita* Schw. (no. 2932), but owing to the priority in position of the present specific name, should be called **P. gnaphaliata** (Schw.) comb. nov. The name was changed by Schweinitz to *Æcidium* (*Cæoma*) *gnaphalitatum* on page 309 of the same work.

2874. 64. C. A. Clematitatum, L.v.S., Syn. Car. 447—and collected in Pennsylvania—a good species.
(447. 18. [Æcidium] Clematitis Sz.
A. pale red, peridia congested, few.
On younger leaves of Clematis Virginiana, Bethany. A valid species?)

Represented neither by a specimen nor a packet. In his Carolina list Schweinitz was in doubt about the validity of his species, but later felt assured, and consequently added "a good species" in his later list. There can be no question, however, that the fungus is one identical with the well-known *Æcidium Clematidis* DC., and which has now been proven by cultures in both Europe and America to be the æcial stage of *Puccinia Clematidis* (DC.) Lagerh. (*P. Agropyri* Ellis & Ev.).

The variable use of *t* and *d* in forming the suffix was not uncommon among the earlier mycologists, where in recent years *d* only is employed, thus the spelling "Clematitis," instead of *Clematidis*, etc.

Schweinitz changed the name to *Æcidium* (*Cæoma*) *clematitatum* on page 309 of his later work.

2875. 65. C. A. Ranunculaceatum, Lk. [n.] 150. Frequent, Carolina (Syn. Car. 440) and Pennsylvania on various species of Ranunculus, e. g. R. abortivus and others.

(440. 11. [Ædidium] Ranunculi (abortivi). Frequent on the round radical leaves, almost devoid of spots.)

Represented by three radical leaves of *Ranunculus abortivus* L., 2.5 cm. broad, mounted, well covered beneath with æcia, and by an empty packet labelled inside "Ædidium *Ranunculi* nitidi Salem," and outside Ædidium ranunculiat Ran abortivi Sal & Bet."

Schweinitz was correct in his first list in considering this fungus distinctive, and in error later in assigning it to Link's inclusive species. It occurs only in America, and in the eastern United States only on *Ranunculus abortivus,* being the æcial form of *Puccinia Eatoniæ* Arth.

*2876. 66. C. A. Cimicifugatum, L.v.S., very beautiful, rather rare on leaves of Cimicifuga racemosa, Bethlehem. Where found almost all leaves are infested.

C. spots large, orbicular, yellow, bullate. Pseudoperidia on the lower surface, concentric, very long, cylindric, apex at first closed, then subfimbriate. Spores orange, becoming white.

Represented by parts of three leaves, each part about 4 cm. long, mounted, showing considerable groups of very long cylindric peridia, and by an empty packet labelled inside "Ædidium Actææ near Easton on Delaware very rare," and on the outside "Ædidium Acteæatum LvS Bethl," with Acteæatum crossed out and "Cimicifugatum" substituted for it.

This imperfectly known rust is even at the present time a rare form. It is probably heterœcious, and may belong to some grass rust. Schweinitz changed the name to *Ædidium* (*Cæoma*) *cimicifugatum* on page 309 of the same work.

*2877. 67. C. A. Hibisciatum, L.v.S., on leaves of Hibiscus militaris, Bethlehem, cultivated, not rare.

C. spots orbicular, yellowish, confluent. Pseudoperidia irregularly but densely scattered, delicate, yellow. Spores not compact but loose, yellowish.

Represented by one obliquely triangular-ovate leaf, 3 by 5 cm., mounted, having many groups of æcia, and by an empty packet labelled "Cæoma Ædidium *Hibiscatum* LvS in H. militaris Beth."

The rust is the æcial stage of *Puccinia hibisciata* (Schw.)

Kellerm. (*P. Muhlenbergia* Arth. & Holw.), on Muhlenbergia and other grasses, as repeatedly proven by cultures. Schweinitz changed the name to *Ædidium* (*Cæoma*) *hibisciatum* on page 309 of the same work.

*2878. 68. C. A. Hepaticatum, L.v.S., scarcely C. quadrifidum, Lk. n. 152. Here and there on degenerate leaves, i. e., not trilobate, but nearly reniform and multilobed, of Anemone hepatica, Bethlehem.

C. spots entirely wanting; the leaf, nevertheless, on which it rests degenerates. Pseudoperidia very large, broad, the margin exactly cleft into four parts, revolute, the lobes broad, brown. Spores fuscous-brown. Occupying the whole leaf.

Represented only by an empty packet labelled "Ædidium Hepaticatum Bethlehem, 24."

It is probable that the failure to recognize this rust as the *Ædidium quadrifidum* DC., found on *Anemone* in Europe, was largely due to the peculiar distortion of the leaf produced by the fungus in the case of *Hepatica*. The form on both *Hepatica* and *Anemone* is the æcial stage of the plum rust, *Tranzschelia punctata* (Pers.) Arth. (*Puccinia Pruni-spinosæ* Pers.), and is on the common liverleaf of the eastern states, *Hepatica Hepatica* (L.) Karst. (*H. triloba* Chaix., *Anemone Hepatica* L.). The combination *Ædidium* (*Cæoma*) *hepaticatum* is made by Schweinitz on page 309 of the same work.

2879. 69. C. A. Geraniatum, Lk. 156, on leaves of Geranium maculatum and G. carolinianum. Exactly identical with the European. Syn. Car. 443.

(443. 14. [Ædidium] Geranii maculati Sz.

A. diffuse, hypophyllous, thickened, red, peridia dense, broad, smooth on the margin, spores yellow.

Frequent and large on leaves of Geranium maculatum. On the upper surface of the leaves it makes a diffuse spot. Peridia densely aggregated. Spores simple, globose, cellular under the microscope, yellow-fuscous; some are united in pairs as if compound, and very rarely are furnished with a pedicel.)

Represented by the central part of a leaf, 2 by 3 cm., mounted, showing one large group of æcia, and by an empty packet labelled inside "Ædidium Geranii maculat Salem," and on the outside "Ædidium *Geraniatum* LvS G. maculat Salem."

Schweinitz's inclusion of *Geranium carolinianum* as one of the hosts must have been a hasty generalization. A specimen of this plant in the phanerogamic herbarium at the Philadelphia Academy of Sciences, obtained by Schweinitz at Salem, shows that he was familiar with the plant, but no æcia are known to have ever been collected on the species, or on any American *Geranium* with similar leaves.

Although Schweinitz adopted Link's name, yet Link hesitated to place the American rust under his species, and properly so as time has proven. Link's form is a stage of *Uromyces Geranii* (DC.) Otth & Wartm., an entirely different rust.

The Schweinitz form is the æcial stage of *Puccinia Polygoni-amphibii* Pers., as established by cultures in both this country and Europe. Recently some European mycologists have considered that the American form of this widespread species should be treated as distinct from the European form. But it would doubtless be better to consider the species as made up of a number of more or less distinct races, and that the common form in America is a race different from the common form in Europe.

2880. 70. C. A. Impatientatum, L.v.S., Syn. Car. 442, Link pag. 57 in a note, also Bethlehem.

(442. 13. [Æcidium] Impatientis Sz.

A. effuse, large, becoming pale, peridia in the center, sparse, crenate, spores rather large, yellow-fuscous, simple.

Frequent in May on the leaves of Impatiens maculata. It swells the leaves and stains a broad yellowish spot, darker in the center.)

Represented by part of a leaf, about 3 cm. long, and 2 cm. wide, mounted, bearing a single large group of æcia, and by an empty packet labelled inside "Æcidium Impatientis Salem," and outside "Æcidium *Impatientat* LvS Salem."

Link, at the place cited, indicated the possibility that this form might belong with the preceding one. It is, however, different, although having much similarity in gross appearance. It is, in fact, the æcial form of the American *Puccinia Impatientis* (Schw.) Arth. (*P. perminuta* Arth.), having telia on *Elymus, Agrostis* and other grasses, as proven by cultures. The name was changed by Schweinitz to *Æcidium* (*Cœoma*) *impatientatum* on page 309 of his later work.

2881. 71. C. A. Berberidatum, Lk. 157, on Berberis canadensis, Carolina.

This number is not starred, and it is probable that a reference to the record in the North Carolina list was omitted unintentionally. It is here added.

(437. 8. [Æcidium] Berberidis. Rather rare on leaves of Berberis vulgaris, covering the mountains of Wilkes County.)

Represented by a mounted specimen of a stout, ash-gray stem, 3.5 cm. long, having two fascicles of leaves, two full-grown leaves in one fascicle and three in the other, each leaf 1.5 by 3 cm. or somewhat less, bearing a number of small groups of young æcia, one group only appearing mature (see cut). There is also an empty

FIG. 1. From a photograph of the mounted specimen in the Academy of Natural Sciences of Philadelphia, basis of Schweinitz's No. 2881. Each specimen in the mounted set is treated essentially in the same manner. The writing was done by Michener. Engraved full size.

packet labelled inside "Æcidium Berberidis," and on the outside "Æcidium Berberidat in Berb canad Salem."

The rust is the æcial stage of *Puccinia poculiformis* (Jacq.)

Wettst. (*P. graminis* Pers.), whose telia are very common on grains and other grasses. The æcia have never been taken in America upon wild species of barberry, unless this record by Schweinitz is such an instance. In the Carolina list they are said to occur on Berberis vulgaris "covering the mountains of Wilkes County." Evidently Schweinitz sometime after collecting his specimen somewhere in the vicinity of Salem learned that the native Berberis in the mountains near Salem, N. C., is *B. canadensis,* and his collection was later so labelled and so recorded in his North American list.

There is in the herbarium of the Academy of Natural Sciences of Philadelphia an ample and characteristic phanerogamic specimen of *B. canadensis* from Salem, N. C., collected by Schweinitz, and another from Statesville, N. C., collected by Gray, Sargent, Redfield and Canby, making it certain that *B. canadensis* did occur as stated. But comparing the mounted cryptogamic specimen, which must certainly have been the original collection, it is easy to see that it does not agree well with the phanerogamic specimen by Schweinitz or the same species by others, as it has the ash-gray bark of *B. vulgaris,* instead of the dark reddish-brown bark of *B. canadensis.*

The evidence goes to show that although Schweinitz may have observed the native barberry "covering the mountains," yet the rust was "rather rare," and on *Berberis vulgaris,* as it has generally been found to occur during the years that have followed, not only in the Carolinas but throughout the eastern United States. There is no reason to think that the rust will not as readily infect any *Berberis* in its native state as it does the cultivated species, but up to the present time there is no such authentic record.

*2882. 72. C. A. grossulariatum, Lk. 162. Very frequent on various species of Grossularia in the mountains of Pennsylvania.

Represented by twenty leaves mounted loose in a packet, the largest about 2 cm. across, showing a number of small groups of æcia, and by an empty packet labelled on the outside "Ædidium grossulariat Mauchunk in Gros oxya," with an evident emendation written within "et Mauch Chunk Pensylva. in Rib oxyacanth Lv."

Except one greenish fragment, the leaves are all of a dark brownish tint and similar in appearance. They may well be *Grossularia oxyacanthoides* (L.) Mill. (*Ribes oxyacanthoides* L.).

The rust is the æcial stage of *Puccinia Grossulariæ* (Schum.) Lagerh., having telia on many species of *Carex*.

2883. 73. C. A. Hypericatum, L.v.S., Syn. Car. 451, Lk. 159, here and there, also near Philadelphia.

(451. 22. [Æcidium] Hyperici frondosi Sz.

A. suborbicular (orange), peridia cylindric, elevated (white when dry), spores white.

Frequent on leaves of Hypericum frondosum. Narrows of Yadkin, very beautiful, bright orange, making rather small but numerous spots sometimes almost devoid of the distinctive color. Peridia elevated as in Æc. Rhamni, to which somewhat related. Spores oblong, white, rather pellucid.)

Represented by a dozen or so leaves, partly attached to short stems, mounted loose in a packet, the leaves showing a few small, circular groups of white, cylindric æcia, and by an original packet containing a few leaves labelled inside "Æcidium Hyperici frondosi Narrows of Yadkin," and outside "Æcidium *Hypericatum* LvS Hyp frond Narrows of Yadkin Carol."

The host agrees with a phanerogamic specimen, labelled by Schweinitz "Hypericum frondosum, Salem," now in the collection of the Philadelphia Academy, which is identified as *H. prolificum* L. The rust is the æcial stage of *Uromyces Hyperici-frondosi* (Schw.) Arth., and is undoubtedly on *Hypericum prolificum* L. (*H. frondosum* Michx.). The combination *Æcidium* (*Cæoma*) *hypericatum* Schw. was made on page 309 of the later work.

2884. 74. C. A. Violatum, Lk. 158, Syn. Car. 439, on leaves of various violets of Carolina and Pennsylvania, e. g., V. cucullata, obliqua, hastata, and the like.

(439. 10. [Æcidium] Violæ Conspect. fung. Niesk. p. 118. Occurs especially on Viola hastata, but also on other stemmed violets.)

Represented by two specimens mounted, one of them being the end of a stem with two folded, cordate leaves and one young seed capsule, having æcia on the blade, petioles, stipules, and stem, and by a corresponding empty packet labelled "Æcidium Violatum V. *hastatæ* LvS Salem."

This specimen has large æcia, and spores that correspond to the æciospores of *Puccinia Violæ* (Schum.) DC.

The other mounted specimen consists of one reniform leaf, 3 cm. broad, bearing three groups of æcia; and there is a corresponding empty packet labelled "Æcidium Violatum V. obliqua Beth."

This specimen shows smaller æcia, and much smaller æciospores than the other, and is doubtless the æcial stage of *Uromyces pedatatus* (Schw.) Sheldon. The host is in all probability *Viola primulæfolia* L.

*2885. 75. C. A. pedatum, L.v.S., in some years very common on leaves and petioles of Viola pedata, Bethlehem.
C. spots very small, much elevated and proportionally thick, purplish, almost everywhere covered with rather large, somewhat high, subcylindric pseudoperidia. Spores pale.

Represented by six leaves and one flower, mounted loose in a packet, showing many æcia, and an original packet, containing two very small leaves bearing a few small, irregular groups of æcia, which is labelled "Æcid *Viol. pedatæ* Lv Bethl."

The æcia and spores of this specimen, which are clearly on *Viola pedata* L., agree with those which were shown by cultures in 1910 to be the æcial stage of *Uromyces pedatatus* (Schw.) Sheldon (*U. Andropogonis* Tracy), having telia on species of *Andropogon*. The name was changed to *Æcidium* (*Cœoma*) *pedatatum* on page 309 of the same work.

*2886. 76. C. A. sagittatum, L.v.S., on leaves of Viola sagittata, Bethlehem. Scarcely the same.
C. spots purple, but yellowish on the lower surface. Pseudoperidia slightly elevated, sparse, without order, on bullate spots, pale. Spores concolorous.

Represented by a short caudex with five attached leaf stalks and three leaf blades, two of full size, 3 cm. long, one blade and one petiole bearing indefinite groups of æcia, and by an empty packet labelled "Æcid. *Violæ sagittat* LvS Bethl."

The necessity of discriminating microscopic fungi chiefly by their gross appearance and the effect produced upon the host led Schwei-

nitz to think this collection "scarcely the same" as the preceding one on *Viola pedata*, although a careful microscopic examination shows that it has the same small spores and other characters which go with the æcia of *Uromyces pedatatus* (Schw.) Sheldon. The name was changed to *Æcidium* (*Cæoma*) *sagittatum* on page 309 of the same work.

2887. 77. C. A. luminatum, L.v.S., Syn. Car. [as A.] nitens, 458, also frequent in Pennsylvania on Rubus. The leaves, which with the whole plant are infested by this Æcidium, are degenerate (year after year.)

(458. 29. [Æcidium] nitens Sz.

A. simple, elongate, peridia very large, yellow, brilliant, at length irregularly ruptured, spore mass orange.

Frequent on leaves, petioles and younger shoots of Rubus strigosus. Its perennial return so infests plants of the whole region that finally it entirely destroys them; summer. Resembles a Uredo, but it has a distinct peridium. Peridia finally confluent with each other.)

Represented by five parts of leaves, each about 4 or 5 cm. long, in a mounted packet, and by many leaves and leaflets in the original packet, which is labelled inside "Æcidium nitens in Rubo villoso Salem Bethl Neujork," and in another place "Cæoma luminatum," and on the outside "Æcidium luminatum LvS in Rub. villos Bethl & Salem." All the leaves are covered with the rust and show the characteristic degeneration of the host.

It was the custom generally followed by Schweinitz to preserve but the one original collection to represent each species. It is quite evident from its appearance that the ample material of the present species was all gathered at one time, and that it is all, or nearly all, from one plant, as it is very uniform. A part of the material has been seen by Dr. P. A. Rydberg, who monographed the genus *Rubus* for the "North American Flora," and he states that the host can not possibly be *R. strigosus*, but that it may be *R. procumbens* Muhl., or more likely its southern representative *R. Enslenii* Walt., both of which usually passed under the name of "*R. villosus*," a century ago. It will be noticed that Schweinitz labelled his collection *R. villosus* and did not change it afterward, although he added Bethlehem and New York for additional localities, and even changed the name of the rust to what he doubtless considered a better name, and

then turned the packet and placed on the outside his final record, still with the host as *R. villosus*. It is impossible even to surmise why he used *R. strigosus* in the last printed account. The rust has never been found on *R. strigosus* in all the intervening years, and the use of that name by Schweinitz may certainly be taken as an error.

The rust itself is of special interest. Until very recently it has been identified with a similar rust of Europe, *Gymnoconia interstitialis* (Schl.) Lagerh., a long cycle, autœcious form, as proven by cultures. The same long-cycle form also occurs in this country, as also proven by cultures. Recently investigations by Kunkel have shown that there also occurs in this country a short-cycle form, whose telia are indistinguishable in appearance from the æcia of the long-cycle form, but differ in their mode of germination, and that only the short-cycle form has so far been observed in the southern states, although both forms occur northward. The senior author has recently (*Bot. Gaz.* 63:504. 1917) erected a new short-cycle genus with Schweinitz's Salem collection as the type, so that it becomes *Kunkelia nitens* (Schw.) Arth. The combination *Æcidium* (*Cœoma*) *luminatum* was made on page 309 of Schweinitz's later work.

2888. 78. C. A. Podophyllatum L.v.S., Syn. Car. 435. Link on account of my inaccurate words in Syn. Car.—"Spores bilocular," inserted by a slip of the pen from the description of *Puccinia Podophylli*, an entirely different fungus—has wrongly placed this Æcidium, the most remarkable of all, among the Puccinias. Ours usually occurs with thick bullate spots, rendering the broad leaves of Podophyllum contorted and deformed—with a diameter of 4–6 inches. Pseudoperidia located in the center, slightly elevated, very densely crowded, rather large, and innumerable. The margin of the spot, however, always sterile. Spores are not bilocular.

(435. 6. [Æcidium] Podophylli Sz.

A. very large, orbicular, at length diffuse, golden yellow, very dense, spores somewhat elevated, bilocular.

Usually it extensively and injuriously affects the leaves and stems of Podophyllum, attracting the eye by its beautiful color.)

Represented by four pieces of leaves about 4 by 6 cm., mounted loose in a packet, which are well covered with large groups of æcia, and by an original packet containing a number of large fragments of

leaves, bearing æcia, which is labelled "Æcidium *Podophyllat* LvS Sal & Beth."

The rust is the æcial form of the long-cycle, autœcious species, *Puccinia Podophylli* Schw. (see no. 2939), on *Podophyllum peltatum* L. The combination *Æcidium* (*Cœoma*) *podophyllatum* was made on page 309 of the later work.

*2889. 79. C. A. tenue, L.v.S., rather rare on leaves of Eupatorium ageratoides, Bethlehem.

C. spots yellowish, evanescent, very delicate. Pseudoperidia sparse, slightly elevated, but, what is peculiar, erumpent on both surfaces, closed on the upper, open on the under. Spores pale.

Represented by a mounted portion of leaf, cut 3.5 cm. square, bearing six or eight groups of æcia, and by an empty packet, which is labelled inside "Æcidium tenue Nobis In fol ignot Deetwiler," and afterward "Eupat. agerat" substituted for "ignot," and is labelled outside "Æcidium tenue in fol Eupat ageratoid Dettyler."

This is the æcial form of *Puccinia tenuis* (Schw.) Burrill, an autœcious rust. The name is written *Æcidium* (*Cœoma*) *tenue* on page 309 of the same work.

*2890. 80. C. A. Euphorbiæ hypericifoliæ, L.v.S., frequent on leaves of E. hypericifolia, Salem and Bethlehem. It is not identical with C. Euphorbiatum Lk., nor does it make the leaves degenerate.

C. spots small, deep purple on the upper surface, yellowish on the lower. Pseudoperidia aggregated, subconically elevated, and somewhat excavated. Spores orange.

Although this number is starred and the earlier work is not directly cited, yet the naming of Salem as a locality undoubtedly has reference to Syn. Car. 455, which in fact must be considered the basis of Schweinitz's new name.

(455. 26. [Æcidium] Euphorbiæ. Here and there on the leaves of Euphorbia hypericifolia, but does not make them degenerate.)

Represented by a mounted fragment of a leaf, about 1 cm. square, well covered with æcia, and by an empty packet labelled "Æcidium *Euphorb.* hypericif Salem."

The rust is the æcial stage of *Uromyces proëminens* (DC.) Pass., and the host is *Chamæsyce Preslii* (Guss.) Arth. (*Euphorbia Preslii* Guss.), which passed under the name of *E. hypericifolia* in Schweinitz's time. Link's *Cœoma Euphorbiatum* is an entirely different species, being the æcial stage of a heterœcious form. On page 309 of Schweinitz's later work the name is changed to *Ædidium* (*Cœoma*) *Euphorbiæ hypericifoliæ.*

*2891. 81. C. A. Houstoniatum, L.v.S., rather rare, but where occurring very copious on stem, leaves and peduncles of Houstonia cœrulea, Bethlehem.

C. without distinct spots. Pseudoperidia elevated, pale, subconic, apex contracted, and somewhat excavated. Spores orange. The infected and somewhat degenerate plants, nevertheless, flower.

Represented by three or more entire plants mounted loose in a packet, all considerably drawn, but a few with flowers, and by an original packet containing many rusted plants, which is labelled "Ædidium *Houstoniatum* LvS Beth."

The rust is the æcial stage of *Uromyces houstoniatus* (Schw.) Sheldon, having telia on *Sisyrinchium,* as proven by cultures. The combination *Ædidium* (*Cœoma*) *houstoniatum* is made on page 309 of the same work.

*2892. 82. C. A. Claytoniatum, L.v.S., on C. virginica from New York. Communicated by Dr. Torrey.

C. almost simple and without spots, occupying the entire leaf. Pseudoperidia broad, sparse. Spores orange.

Represented by a mounted stem, 5 cm. long, with one unopened flower and two leaves, the leaves covered with æcia, and by an original packet containing one narrowly linear leaf, 6 cm. long, and labelled "Ædidium *Claytoniat* LvS Torrey."

A rather common rust, being the æcial stage of *Puccinia claytoniata* (Schw.) Peck. Schweinitz made the combination *Ædidium* (*Cœoma*) *claytoniatum* on page 309 of the same work.

*2893. 83. C. A. Pyrolatum, L.v.S., on the under side of the leaves of Pyrola rotundifolia. Dr. Torrey.

C. without spots. Pseudoperidia sparse, occupying the whole leaf, but not transforming it, pulvinate-elevated, pale, or orange with

the spores. Finally these having fallen out Peziza-form cavities are left in the leaf.

Represented by half of a leaf, nearly 4.5 cm. broad, mounted, which is thickly covered with uredinia, and by an empty packet labelled "Æcidium *Pyrolatum* LvS in P. rotundifol Torr."

The rust is the uredinial stage of *Melampsoropsis Pyrolæ* (DC.) Arth. (*Chrysomyxa Pyrolæ* Rostr.), but was naturally mistaken for an Æcidium by Schweinitz, as it possesses catenulate spores. The host may have been *P. uliginosa* Torr., rather than *P. rotundifolia* L. The name *Æcidium* (*Cœoma*) *pyrolatum* is used by Schweinitz on page 309 in the same work.

*2894. 84. C. A. Myricatum, L.v.S., on leaves and especially on petioles of Myrica cerifera, communicated to me from New York by my friend Dr. Torrey.

C. spots on strongly swollen petioles, dark purple, black where dry, and out of the spots project the dense pseudoperidia, rather large, widely open, brown, filled with yellowish spores.

Represented by a mounted specimen, consisting of a terminal portion of stem, 2 cm. long, with four leaves attached, three being somewhat over 4 cm. long and 18 mm. wide, and with an abundance of æcia on the hyertrophied terminal bud, 2.5 cm. long, and by an original packet containing 3 cm. of stem with four leaves attached but without æcia, which is labelled on the inside "Æcidium Myricæ on Myrica cerifera L." and on the outside "Æcidium *Myricatum* LvS in Myr. cerifera Torrey."

This is the æcial form of *Gymnosporangium myricatum* (Schw.) *Fromme* (*G. Ellisii* Farl.), as proven by cultures, the telia of which occur on *Chamæcyparis thyoides* (L.) B. S. P. The name is changed to *Æcidium* (*Cœoma*) *myricatum* on page 309 of the same work.

*2895. 85. C. A. Osmundatum, L.v.S., found on the fronds of Osmunda spectabilis and communicated by Torrey, but in drying so destroyed, that it is not possible correctly to describe it: the species nevertheless evidently distinct: spores ferruginous.

Represented by a narrowly triangular, lateral part of frond, 2.5 cm. long, blackish purple, mounted, and by an empty packet labelled "Æcid? Osmundatum in O. spectab Torrey." Schweinitz used the

name *Æcidium* (*Cæoma*) *osmundatum* on page 309 of the same work.

The structure of this fungus is not evident, although there is an abundance of globoid, brown spores present. The spores are 13–16 μ in diameter, and echinulate or verruculose. They resemble smut spores, but Clinton in his monograph of the Ustilaginales in the North American Flora (7:24. 1906), where it is mentioned as *Ustilago Osmundæ* Peck, excludes the species from that order and suggests that it may be a Hyphomycete. The latest name is *Mycosyrinx Osmundæ* Peck (*N. Y. State Mus. Rep.*, 1911, page 43).

*2896. 86. C. A. Pyratum, L.v.S., rather rare on leaves of Pyrus coronaria, Bethlehem. By no means identical with C. Roestelites.

C. spots on upper surface, orbicular, red; on the border ochraceous, center blackish. On the lower side there appear pseudoperidia very densely crowded, subconcentric, only a little elevated, margin beautifully multifid-fimbriate; the parts straight, not at all revolute, divergent, pale. Spores fuscous.

Represented by one oblong leaf, 3.5 cm. long and 1.5 cm. broad, broken across the middle, and mounted loose in packet, bearing numerous æcia on a somewhat hypertrophied spot, and by an empty packet labelled on the inside "Cæoma (Rœstelia) coronariatum LvS Salem in Pyr. coronar," with "Æcid" later substituted for Rœstelia, and on the outside "Æcidium *Coronariatum* LvS in Pyro conar. Salem."

The leaf is clearly that of *Malus coronaria* (L.) Mill. (*Pyrus coronaria* L., *P. angustifolia* Ait.), the rust being æcia of *Gymnosporangium Juniperi-virginianæ* Schw. To the mounted specimen is attached another packet containing a little larger, more lanceolate leaf, with numerous æcia of the same sort, bearing an inscription by Dr. W. G. Farlow, saying it is from the Herb. Curtis, on *Pyrus angustifolia,* Society Hill, N. C., no. 1226, and corresponds with Schweinitz's type of *A. pyratum.* The name *Æcidium* (*Cæoma*) *pyratum* is given on page 309 of the same work.

*2897. 87. C. A. sambuciatum, L.v.S., Syn. Car. 441, frequent on petioles and leaves of Sambucus canadensis, also Bethlehem. A further diagnosis follows.

C. spots intumescent, often very large (i. e. 2 inches) on petioles,

rather pale. Pseudoperidia large, dense, elevated, orange or pale, margin fuscous. Spores orange-fuscous, becoming decolored. All much smaller on the leaves—pseudoperidia densely aggregated.

(441. 12. [Ædidium] Sambuci Sz.

A. maculiform, large, thick, contorting the leaves, orange, becoming white, peridia minute, and spores simple, pale.

Chiefly on the larger veins on the leaves, and on the petioles of Sambucus Canadensis. It distorts the leaves. Color orange-saffron; peridia sparse, spore-mass pale yellowish white.)

Represented by parts of two compound leaves and bits of hypertrophied rachis, mounted loose in a packet, showing numerous small groups of æcia, together with an original packet containing fragments of two leaves, also bearing small groups of æcia, labelled on the inside "Æcidium Sambuci In Samb canad. Sal & Bethl," and on the outside "Æcidium *Sambuciatum* LvS Bethl."

This is the æcial condition of *Puccinia Sambuci* (Schw.) Arth. (*P. Bolleyana* Sacc.), a common rust in the eastern United States, having telia on *Carex*. The asterisk before this number is a typographical error. The name *Ædidium* (*Cæoma*) *sambuciatum* is given on page 309 of the same work.

2898. 88. C. A. Urticatum, Lk. n. 169, Syn. Car. 436, very rare on Urtica. Salem, also at the same place on Cynoglossum amplexicaule.

(436. 7. [Ædidium] Asperifolii. Rather rare on Cynoglossum amplexicaule.)

Represented by neither a specimen nor an original packet at Philadelphia or in the Michener collection at Washington, or in the Herb. Curtis at Harvard University. *Cynoglossum virginicum* L. (*C. amplexicaule* Michx.) is not known to bear a rust. Neither is any rust known on *Urtica* so far south as North Carolina, although æcia are common north of the 39th parallel of latitude.

The association of *Urtica* and *Cynoglossum* probably is carried over from European observations as given in the work by Albertini & Schweinitz (l. c., p. 117). It is probable that some appearance of the leaves misled Schweinitz into thinking that he had found in America the same rusts he had observed in Saxony.

γ Subgen. RŒSTELIA or CERATITES.

2899. 89. C. R. Cylindrites, Lk. n. 172, Syn. Car. 432, under this name are included the following Cæomata, perhaps to be separated as species.

α. C. Cratægi punctatæ, pseudoperidia divergent fibrous, swollen in the middle—white. Pennsylvania.

β. C. Cratægi arborescentis, spots small, red, pseudoperidia not fibrous, of various forms, fuscous-red. Near Fayetteville, Carolina.

γ. C. Oxyacanthæ, very large, very frequent near Philadelphia in hedges.

δ. C. Mali, on leaves of Pyrus malus and coronaria, spots small but effuse. Pseudoperidia minute.

(432. 3. [Æcidium] Cratægi var. Oxycanthæ. A rare species on leaves of various Cratægi.)

Represented in each of the four forms by specimens and original packets from which it is possible to show that Schweinitz's surmise was right, that they belonged to four distinct species.

α. Represented by one leaf, 8 cm. long, of what is probably *Cratægus punctata* Jacq., mounted, bearing six groups of æcia, and by two smaller but similar leaves, about 6 cm. long and 4.5 cm. broad, with no mature æcia, in the original packet, labelled inside "Rœstelia (cornuta) oxyacanthæ In Crat. pyrifol Bethl," with "cornuta" crossed out, and "Cæoma cylindrites" written above, and outside labelled "Cæoma (Ceratites) *Cratægi punctatæ* Bethl aff. penicillat."

The rust proves by microscopic examination to be the æcia of *Gymnosporangium globosum* Farl.

β. Represented by a mounted leaf, 4.5 cm. long and about same width, of what is probably *Cratægus viridis* L. (*C. arborescens* Ell.), bearing four groups of æcia, and by half of a similar leaf with one group of pycnia, in the original packet, labelled outside "Cæoma (Ceratites) Æcidium *Cratægi arborescentes* Fayetteville." Half of a similar but smaller leaf, with one group of æcia, is in the Michener collection at Washington, property of the U. S. Department of Agriculture.

This æcial rust is that of the very distinctive southern species *Gymnosporangium hyalinum* (Cooke) Kern, whose telia are not yet known.

γ. Represented by a large, 4.5 cm. broad and originally much

longer leaf, mounted loose in a packet bearing five large, circinating groups of æcia, and by a small fragment of leaf about 3 cm. long, bearing æcia, in the original packet, labelled inside "Rœstelia oxyacanthæ α in Crat. oxyacant prope Philadelphia," and above this written later "Cæoma cylindrites," and labelled outside "2 Cæoma (Ceratites) cylindrites oxyacanthæ in Hedgerows Philad. vulgatissima."

This æcial rust observed by Schweinitz to be very common, on what was doubtless the English hawthorn (*Cratægus Oxyacantha* L.) and thought distinctive, was not again recognized until a trip by Dr. Frank D. Kern and the senior author to South Carolina in March, 1910, brought it to light. It belongs to *Gymnosporangium trachysorum* Kern, having telia on *Juniperus virginiana*.

δ. Represented by one large, 5 cm. broad, and originally 10 cm. long, strongly pubescent leaf of the cultivated apple, bearing numerous small groups of æcia, one half, 4 cm. long, being mounted, and the other half, 5 cm. long, in the original packet, which is labelled inside "Rœstelia cancellata In Pyro coronario Salem," with all but the first word afterward crossed out, as if it were an error, and "β penicillatum var Mali" substituted, and added below "var. in Malo Bethl," and still later there was written above "Cæoma cylindrites," while on the outside the packet was labelled "2 Cæoma (Ceratites) cylindrites β penicillat in Pyr. Malo Beth."

The rust proves to be the æcial stage of *Gymnosporangium Juniperi-virginianæ* Schw. and on the common apple *Malus Malus* (L.) Britton (*Pyrus Malus* L.).

The entry in the North Carolina list, no. 432, is not represented by a specimen, and is too indefinite to be associated with any certain species, unless the form β be considered to cover it.

2900. 90. C. R. Roestelites, Lk. 173. Æcid. cancellatum, Syn. Car. 433 [error for 431]. In Bethlehem in an old orchard rejoicing in huge trees of Pyrus malus. In late autumn I have seen some of these trees, for 6–7 years, so covered by this fungus that the leaves appear red from a long distance.

(431. 2. [Æcidium] cancellatum. Very rare, only once on pear leaves.)

Represented by two sets of very unlike leaves, part of each being

mounted. One of these consists of parts of two apple leaves, cut lengthwise, 5 or 6 cm. long, mounted, bearing many small groups of æcia, and two similar pieces of leaves in the original packet, which is labelled "Cæoma Æcid. Rœstelites cancellat in Pyro malo arbores maximas ad mortem ægens 1829 Bethl." The other consists of two ovate pear leaves (*Pyrus communis* L.), 6 cm. long, mounted, and two similar, smaller leaves with another fragment in the original packet, each leaf bearing one to three large groups of æcia, the packet being labelled "2 Cæoma (Ceratites) Æcidium *Rœstelites* cancellat in Pyro Bethlehem."

The æcia on the apple leaves belong to *Gymnosporangium Juniperi-virginianæ* Schw., and those on the pear leaves belong to *G. globosum*.

2901. 91. C. R. Fraxinites, L.v.S., Syn. Car. 430, Lk. 170, Æcidium fraxini. Rather to be placed here; here and there; Bethlehem, on ash leaves.

(430. 1. [Æcidium] Fraxini Sz.

A. peridia elevated into a depressed chestnut-colored cone, at length splitting into the broad laciniæ. It makes round chestnut spots on the leaves, prominent beneath, flat above, surrounded by a fuscous margin.)

Represented by two lengthwise halves, 1.5 by 6 cm., of broadly lanceolate leaflets, mounted, together bearing thirteen round groups of æcia on much swollen dark spots, but too young to show open peridia, and by an empty packet, labelled inside "Rœstelia Fraxini In Frax. Salem," with a later addition above "Cæoma Rœstelites *Fraxinitum*," with "Rœstelites" afterward crossed out, and labelled on the outside "Æcidium (Ceratites) *Fraxinites* LvS Salem & Beth."

The rust is the æcial form of *Puccinia fraxinata* (Link) Arth., on species of *Fraxinus*, having its telia on the marsh grass, *Spartina*.

[*]2902. 92. C. R. Botryapites, L.v.S. Very rarely observed on leaves of Aronia botryapium, Bethlehem; but where it occurs, rather frequent.

C. entirely distinct—spots yellowish-buff, somewhat effuse. On the under side the pseudoperidia appear central, aggregated as tubercles, globose, yellowish-green, at first obtusely conic and partly closed, at length somewhat open and much fimbriated at the opening, the divisions chestnut-brown, flexuous. Spores scanty, dark. Pseudoperidia few, even at times single.

Represented by four leaves, one of them 4 by 6 cm., the others trimmed down to that size from larger leaves, mounted loose in a packet, bearing seven characteristic galls, and by an original packet with eight similar leaves, 4–7 cm. long, having bleached spots but no rust, which is labelled "Æcidium (Ceratites) *Botryapii* LvS Bethl 1830."

The rust is the æcial stage of *Gymnosporangium botryapites* (Schw.) Kern. At page 310 of the same work Schweinitz changed the name to *Ceratites* (*Cæoma*) *botryapites*. The asterisk was erroneously omitted from this number.

δ. Subgen. PERIDERMIUM.

2903. 93. C. P. Pineum, Lk. 175, Syn. Car. 456. In Pennsylvania near Philadelphia and elsewhere, not rare. Specimens ample, a foot long, found by me on the trunk itself of Pinus inops, suggesting a resemblance to Gymnosporangium Juniperini.

(456. 27. [Æcidium] Pini. Rare with us, and only on young leaves.)

Represented by two specimens. One of these consists of the section of a woody gall, 3 cm. across, mounted, with an empty packet, labelled "Cæoma Peridermium Pini in Ligno Philad." A similar portion of a gall is in the Michener collection at Washington, property of the U. S. Department of Agriculture.

The other consists of about a dozen slender leaves from a 2-leaved pine, none full length, now about 5.5 cm. long, mounted loose in a packet, bearing a few æcia, with an empty packet, labelled "Cæoma Peridermium Pini in acubus Salem."

Microscopic examination shows the woody form to be *Peridermium cerebrum* Peck, the æcial stage of *Cronartium Quercus* (Brond.) Schröt., and the leaf form to be *P. intermedium* Arth. & Kern.

*2904. 94. C. P. germinale, L.v.S., very rare on the fruits of roses. Communicated to me by Mr. Collins.

C. pseudoperidia very long, cylindric, somewhat compressed, at length white, fimbriate, divisions cleft to the bottom, free. Spores effuse, pale. Pseudoperidia rising from little pits in the fruit, without any spot, usually three lines long.

Represented by a single oblong fruit, 1.5 cm. long, bearing many long and colorless peridia, and by the original empty packet labelled "Cæoma Peridermium *germinale* LvS in germinib. Rosæ Collins."

Although the fruit has considerable resemblance to a mummied rose hip, yet it is certainly the fruit of some species of *Cratægus*, and the fungus is the æcial stage of *Gymnosporangium germinale* (Schw.) Kern (*G. clavipes* Cooke & Peck). The name is given as *Peridermium* (*Cæoma*) *germinale* on page 312 of the same work.

Genus 212. Puccinia Lk. and Dicæoma Fr.

2905. 1. P. Graminis, Lk. n. 1, Syn. Car. 492. Very common also in Pennsylvania on grasses.
(492. 7. [Puccinia] Graminis. Frequent on the culms of grasses, especially Andropogon.)

Represented by the original packet containing a crumpled leaf, and some fragments of stem and sheaths, all apparently of wheat, *Triticum vulgare* Vill., bearing blackish, open telia of *Puccinia poculiformis* (Jacq.) Wettst. (*P. graminis* Pers.), together with six or seven parts of conduplicate leaves, about 3 mm. wide, the pieces being from 6 to 15 cm. long, and heavily covered with dark brown or blackish telial sori. The narrow leaves are undoubtedly some species of *Carex*, and the rust some species other than *P. poculiformis*, but the identity of neither rust nor host has been definitely determined. The packet is labelled "Puccinia Graminis cerealis Germ. Sal. Beth."

One of the pieces of sheath bears a small strip of gummed paper across the middle, showing that it had originally been attached to a sheet (see Shear, *U. S. Dept. Agric. Bull.*, 380, p. 6, Jan. 15, 1917). The writing on the packet appears to have been done all at one time. It is, of course, impossible to say definitely if the material in the packet is wholly American, or partly obtained in Germany, as the labelling might indicate, but from the appearance it may be inferred that it represents two collections, both from this country.

*2906. 2. P. striola, Lk. n. 2, on various Cyperaceæ and grasses. Bethlehem.

Represented by the original packet containing a dozen or more short pieces, 1–6 cm. long, of a *Juncus*, probably *J. effusus*, bearing

uredinia and telia, the spores being those of *Uromyces Junci-effusi* Syd. The packet is labelled "2 Puccinia *Striola* Beth," the "2" indicating that the original collection had been divided into numbered portions, of which no. 2 only had been retained.

2907. 3. P. Arundinariæ, L.v.S., Syn. Car. 487, Lk. p. 68 in a note. Very good species, also on Miegia (Arundinaria) cultivated in the Bartram Gardens, Philadelphia.

(487. 2. [Puccinia] Arundinariæ Sz.

P. rather large, elevated, pulvinate (not surrounded by the epidermis), blackish-brown, spores oblong, bilocular, pedicel long.

Rather rare on leaves of Arundinaria. Of the size of a mouse dropping, beautifully scattered over the leaves. Cells of the spores equal to each other, color under a lens yellow, pedicels longer than the spore, radiately divergent, white, pellucid.)

Represented by an original packet containing a part of a leaf, 1 by 5 cm., which bears three telial sori in a row, two being empty of spores. The single sorus with spores is prominent, oblong, and dark brown or blackish. The packet is labelled "Puccinia *Arundinariæ* LvS Salem."

The rust still bears the name given it by Schweinitz. Its æcial form has not yet been discovered.

*2908. 4. P. punctum, Lk. n. 3, on Carex and Scirpus, Bethlehem.

Represented by two packets, one containing *Carex* and the other *Scirpus*, both rusted, together with a duplicate packet of the latter. One packet has a dozen or more, rather soft, crumpled leaves with a few stems, all heavily rusted, labelled "Puccinia graminis var. hortensis Beth," and afterward graminis crossed out and "Punctum" substituted. The rust proves to be the telial stage of *Puccinia Grossulariæ* (Schum.) Lagerh., and on some species of *Carex*.

Another packet contains twenty-five or more pieces of leaves, 3–9 cm. long, of what appears to be *Scirpus cyperinus* (L.) Kunth, abundantly rusted, labelled on the inside "Puccinia *Caricicola* LvS Beth," with "Puccinia punctum Lk" added later, and on the outside "Puccinia punctum Beth in Caricibus." The rust is that of *Puccinia angustata* Peck, being the telial stage, only a few urediniospores with their two superequatorial pores being found.

A duplicate packet of the last contains two pieces of similarly rusted leaves, about 3.5 cm. long, and is labelled "5 Puccinia punctum Lk caricicola LvS."

*2909. 5. P. Scirpi, Lk. n. 4, on various Scirpi, Bethlehem.

Represented by the original packet, containing very scanty shreds of leaf blades or sheaths, some of them 3–6 cm. long, and labelled on the inside "Puccinia Scirpi Beth 1826," and on the outside "2 Puccinia *Scirpi* Beth." The rust is clearly the telial stage of *Puccinia angustata* Peck, and the host is doubtless *Scirpus cyperinus* (L.) Kunth. It is entirely different from genuine *P. Scirpi* Link.

*2910. 6. P. Sorghi, L.v.S., frequent on the leaves of Sorghum and Zea cultivated.

P. without spots. Sori broad, difform, variously lobed, at first covered by the epidermis, at length naked but surrounded at the margin, and then the epidermis lacerate. Sori often also as if lobed from the center—2–4 lines long and broad. Larger sori occur on the nerves of the leaves. Spores blackish, large, shortly pedicelled.

Represented by some twenty-five pieces, 1–3 cm. wide and 3–8 cm. long, of leaves of Indian corn, abundantly covered with telia, contained in the original packet, which is labelled "Puccinia *Sorghi* LvS Lititz," with a later addition of "& Zeæ."

The leaves in the original packet are all without question those of *Zea Mays* L., and the rust is the one common to that host. One can only surmise why Schweinitz called the rust *P. Sorghi,* and said it was on *Sorghum,* a genus which has never been known to harbor the rust. But it would seem from the labelling of the packet that Schweinitz thought at first he had to do only with a *Sorghum* rust, and afterward found it was certainly on *Zea,* so assumed that it was on both kinds of hosts.

Because of the inappropriateness of the specific name, some taxonomists have adopted some other name, but most authorities still use Schweinitz's original name on the ground of priority. The alternate stage has been found by cultures to occur on species of *Oxalis.*

*2911. 7. P. Andropogi, L.v.S., very frequent in autumn on leaves and culms also sheaths of various species of Andropogon, Bethlehem.

P. spots obscure, sori densely aggregated, elevated, fuscous, obtuse, linear, short. Spores fuscous. Although not confluent, yet occupying almost the whole leaf.

Represented by an original packet containing four or more stems and many leaves in pieces 7–10 cm. long, bearing an abundance of telia, labelled "Puccinia in *Andropogi* LvS." The host is undoubtedly *Andropogon scoparius* Michx., and the rust still bears Schweinitz's name, although generally written *P. Andropogonis*.

The two methods of writing the specific name indicate a difference in the method of forming the genitive of this and similar Latinized Greek words, common among classical writers of the very early as well as more modern times. The longer form is now generally adopted.

*2912. 8. P. emaculata, L.v.S., here and there on leaves of Panicum, especially Panicum pubescens in fields, Bethlehem and Philadelphia.

P. entirely without spots; at first the sori are all covered, rather few, sparse, erumpent; later often confluent, minute, short, narrow, parallel, mostly acuminate at both ends. Spores very dark, rather small; immersed in water, brownish.

Represented by an original packet containing five fragments of grass leaves, 1–2 cm. wide by 2–10 cm. long, with a scanty showing of telia. The packet is labelled "Puccinia *emaculata* LvS in Panico pubes. Bart Gard." The leaves are somewhat pubescent and considerably weathered. They can scarcely be the leaves of *Panicum pubescens* Lam., but rather are those of the more widely diffused *P. capillare*, judging from the soft pubescence, and from the general association of the rust. A portion of the Schweinitz collection has been seen by Prof. A. S. Hitchcock and by Mrs. Agnes Chase, the eminent agrostologists of Washington, D. C., who pronounce the host to be *P. capillare*.

*2913. 9. P. Junci, L.v.S., on culms of J. effusus, Bethlehem, frequent.

P. scarcely with any spots; sori irregular, erumpent, somewhat covered by the epidermis, rather broad, applanate. Spores large, blackish brown.

Represented by an original packet, containing three pieces, 5–7

cm. long, from a terete stem split lengthwise bearing a few sori. It is labelled "Puccinia *Junci* LvS in J. effuso Beth." The teliospores are one-celled, and together with the few urediniospores seem to agree with later collections on the same host, now called *Uromyces Junci-effusi* Syd.

*2914. 10. P. Windsoriæ, L.v.S., on leaves of Windsoria (Poa) quinquedentata, Bethlehem.

P. spots yellowish, at length evanescent. Sori long, linear, undulate, prominent, erumpent from the epidermis, not confluent. Spores compact, from purple to dark fuscous, long pedicellate.

Represented by an original packet containing ample material, consisting of parts of nine leaves, 3–10 cm. long, and four stems, 7–12 cm. long, well covered with telia. It is labelled "Puccinia *Windsoriæ* LvS in culm & fol Poæ quinquedent Beth."

The rust still bears the name given to it by Schweinitz, but it has been impossible to trace the origin of the name of the host. No such specific name is known under *Poa* or *Windsoria*. Professor A. S. Hitchcock has suggested that it was a slip intended for *quinquifida*, a specific name used under *Poa* by Pursh, but never transferred to *Windsoria*. Neither name is given in Muhlenberg's "Catalogue," but he does have *Poa seslerioides* Michx. (*P. flava* L.), which is clearly the host in question, now called *Tridens flavus* (L.) Hitchc.

*2915. 11. P. Zizaniæ, L.v.S., on the fallen leaves of Zizania. Kaign's Point, near Philadelphia.

P. without spots, minute, at first covered, at length linearly erumpent, the epidermis persistent about the margin of the sori; sori elongate, abbreviate, dark, held to the light somewhat fuscous. Spores loose, usually scattered about, short pedicelled, delicate, not much smaller than in related species.

Represented by an original packet containing two very small shreds of much weathered leaves 1–1.5 cm. long, bearing a few telial sori. It is labelled "Puccinia *Zizaniæ* LvS Kaines Pt."

The fragments remaining of this collection are so very scanty that it seemed at first that no certain conclusion could be reached as to the identity of either host or fungus. The slightly reddish tint,

the character of the surface, the veining, and the rough edges show that these leaves could not have been those of *Zizania*. They do suggest *Andropogon*, however, and in spite of being weathered, they match well the leaves of *A. scoparius* and *A. virginicus*. Moreover, the teliospores, as well as a few urediniospores seen, agree fully with *Puccinia Andropogonis*, n. 2911. While the two Andropogons named can not be told apart by their leaves, we probably have to do with *A. virginicus* which occurs on damp soil about Philadelphia.

2916. 12. P. Smilacis, L.v.S., Syn. Car. 494, also in Pennsylvania.
(494. 9. [Puccinia] Smilacis Sz.
P. rather large, confluent, difform and stellate, dark fuscous, on Smilax rotundifolia occupying all of the somewhat dried leaves.)

Represented by an empty packet labelled "Puccinia *Smilacis* LvS Salem."

There is no doubt that this number is based upon the telia of the common southern Smilax rust, still called *Puccinia Smilacis* Schw.

2917. 13. P. Polygonorum Lk. n. 6, Syn. Car. 488, on P. pennsylvanicum and P. virginicum, also Pennsylvania.
(488. 3. [Puccinia] Polygoni Pensilvanici Sz.
P. rather small, aggregated, somewhat elevated, chestnut brown, opaque, at first closed, seated on pale spots, spores obovate-truncate.
Frequent on Polygonum Pensylvanicum; rendering the plants sterile. Spores bilocular, pedicel short; cells almost broader than long, fuscous under a lens.)

Represented by a packet containing two leaves, one about 3.5 by 5 cm., and the other somewhat smaller, bearing a few sori, which is labelled "Puccinia Polygonorum P. *virginicæ* LvS Salem & Beth."

The leaves are ovate-lanceolate, smooth with ciliate margins, and doubtless belong to *Tovara virginiana* (L.) Raf. (*Polygonum virginianum* L.). The other host named was also correctly determined, without question. The rust is now given the earliest name for it, *P. Polygoni-amphibii* Pers.

*2918. 14. P. concentrica, L.v.S., very frequent toward the end of autumn on half alive and dead leaves of P. coccineum, Bethlehem.
P. spots very large, confluent, bright red on upper surface, paler on the lower. Sori very crowded, aggregately concentric, at first

somewhat compact, black-shining, at length the spores loosened, minute, fuscous black. Possibly it is P. Polygoni-amphibii DeCandolle—but very certainly specifically distinct from the preceding.

Represented by a packet containing about ten fragments of leaves, some nearly complete, showing an abundance of telia, in part circinating about single uredinia. The packet is labelled "Puccinia Polygoni coccinei concentricum omnino differt a P. Polyg virginici et aliis Bethl."

The leaves are broadly lanceolate, about 4 by 10 cm., and agree with those of a phanerogamic specimen at the Philadelphia Academy of Sciences, collected by Schweinitz, locality not given, and labelled by him *Polygonum coccineum,* which is now determined to be *P. emersum* (Michx.) Britt. The rust is *Puccinia Polygoni-amphibii,* as thought likely by Schweinitz, and differs from the preceding species only as influenced by the host.

*2919. 15. P. bullata, L.v.S., Syn. Car. 501, Lk. n. 8. In Pennsylvania, found very large, two to even three inches, especially on stems of Vernonia noveboracensis.

(501. 16. [Puccinia] bullata Sz.

P. very large, oblong, pulvinate, chestnut brown, surrounded by epidermis, spores very dense, oval, bilocular, long pedicelled.

Abnormal, erumpent from dried stem of various plants, e. g., Ambrosia, Chenopodium. Very large, usually an inch long and two lines thick, surrounded and often covered by the epidermis of the plant. The peduncles of the spores are five times as long, spores oval, short, the two cells equal.)

Represented by three packets. The principal packet contains four sections of stem, 3.5–5 cm. long, the largest being 8 mm. in diameter, and is labelled "Puccinia *bullata* LvS Salem & Bethl in Caulibus variis." The two duplicate packets, one with three, the other two, similar fragments of stem, are labelled, the first "3 Puccinia *bullata* LvS," and the second "5 Puccinia *bullata* LvS." Part of the same original collection is in the Fries Herbarium at Upsala, according to Lagerheim (l. c., p. 64), who renamed the species *P. longipes,* because the specific name had been antedated by Link (Obs., 1815).

All the fragments show very large sori, reaching 3 cm. long, characteristic of the rust on *Vernonia* when occurring on the stems. This is undoubtedly the same rust as the leaf form, recorded under no. 2926, as *P. Vernoniæ,* a name still generally applied to this rust. The leaf form has been grown by sowing spores from the large stem sori.

The asterisk before this number is a typographical error.

*2920. 16. P. Pycnanthemi, L.v.S., rather related to P. Clinopodii, frequent on P. incanum, Bethlehem.

P. spots purple, minute, persistent. Sori small, fuscous. Spores loose, long pedicelled.

Represented by an empty packet, labelled on the inside "Cæoma (Uredo) Labiatarum in Pycnanth glauci fol Beth," with *Uredo* crossed out and "Puccinia" substituted, and on the outside "Puccinia *Pycnanthemi* LvS in Pyc incano Beth."

The host can be accepted as correctly named, and the rust as identical with *Puccinia Menthæ* Pers.

*2921. 17. P. compositarum, Lk. n. 19, common, Bethlehem, especially on the stems and leaves of dead Cnicus or Cirsium (*P. caulincola*).

Represented by an original packet containing six sections of weathered stems about 5 cm. long, the largest being 5 mm. in diameter, and all bearing telia. The packet is labelled "Puccinia caulincola vere in caulib. Cnici altissimi," with "compositarum" afterward written in.

The cobwebby hairs on these stems indicate that they are thistles, and there is every reason to believe that they belong to *Cirsium altissimum* (L.) Spreng. (*Cnicus altissimus* Willd.) as labelled by Schweinitz. The rust agrees with *Puccinia Cirsii* Lasch. The reference to "P. caulincola" undoubtedly indicates the author's opinion that his material might possibly be referred to the European *Cæoma caulincola* Nees, which was originally found on stems of *Centaurea paniculata* (Syst. Pilze, 16, 1816). By later authors the specific name was transferred to *Puccinia* and applied to other forms.

*2922. 18. P. maculosa, [L.v.S., not] Straus[s]. Bethlehem, here and there on leaves of Prenanthes or Hieracium. Entirely distinct from the preceding by the broad, white spots, spores much paler.

Represented only by an empty packet labelled "Puccinia *maculosa* LvS in fol. Hieracii." There is a specimen, however, in the Michener Collection at Washington, consisting of a glabrous, pale green leaf, a little more than 4 cm. long and 2 cm. wide, bearing four groups of telia, labelled "2922–18—Syn. Car. Puccinia maculosa Strau. in foliis Hieracii Beth. ex Herb. Schw." There is also a similar representation in the Herb. Curtis at Harvard University on "Prenanthis aut Hieracii," a small portion of which, through the kindness of Dr. W. G. Farlow, the writers have been able to examine. Both host and fungus from these two sources agree perfectly with the material published as 1855, Ellis & Everhart, "North American Fungi," on *Cynthia virginica* from Illinois, 1882, A. B. Seymour, and as 3413, Rabenhorst-Winter, "Fungi Europæi," on *Krigia virginica* (*Cynthia virginica*) from Missouri, 1885, C. H. Demetrio. A good description of the rust was given by Burrill in his "Parasitic Fungi of Illinois," p. 188. It is evident that Schweinitz was very uncertain about the name of the host as he calls it *Hieracium* on packets, and "Prenanthes or Hieracium" in the published account, and quite naturally so, if we consider it to be *Krigia* or *Cynthia virginica,* now called *Adopogon virginicus* (L.) Kuntze, for that plant has the aspect when growing that might well cause it to be considered under either genus. Even Muhlenberg must have been uncertain about it, as his catalogue either does not mention it, or merges it with some other species, although a common plant of the flora.

Strauss gave the name *Uredo maculosa* (*Ann. Wett. Ges.* 2 : 101. 1810) to a European rust on *Prenanthes purpurea,* apparently including both uredinia and telia, with which no rust in America has been identified. The rust found by Schweinitz is a short-cycle form not known in Europe. The specific name *maculosa,* under the genus *Puccinia,* is, therefore, to be credited to Schweinitz.

2923. 19. P. Helianthorum, L.v.S., Syn. Car. 495, Lk. p. 74, clearly distinct—frequent on various Helianthi, and in Pennsylvania best developed on dead leaves. On cultivated H. tuberosus, it occupies the lower surface of almost all leaves.

(495. 10. [Puccinia] Helianthi Sz.
P. rather small, orbicular, aggregated, black, spores globoid-oval, bilocular, very long pedicelled.
Common on many Helianthi.—Spores fuscous yellow, pedicel white, pellucid.)

Represented by an original packet containing twenty or more fragmentary leaves, 1–4 cm. wide by 6–10 cm. long, and a leafy stem, 5 cm. long, bearing one mature flower head, the leaves richly supplied with telia. The packet is labelled "Puccinia *Helianthorum* LvS 1826."

The leaves of this collection are lanceolate or ovate-lanceolate, and probably came from the upper part of the plant. Examination of the leaves together with the flowering head makes it certain that the host is *Helianthus tuberosus* L., and the date, "1826," shows that the collection was made in Pennsylvania, doubtless at Bethlehem. The rust still generally goes by the name first given by Schweinitz, *P. Helianthi*, although his specific name for the æcial stage (no. 2871) has priority of place in the same publication and technically should replace it as *P. Helianthi-mollis*.

Schweinitz evidently inserted "clearly distinct" under this entry, and similar expressions in the following and other entries to emphasize his dissent from Link's opinion (l. c.) that the species might be the same as the European *P. Syngenesarum* Link.

2924. 20. P. Heliopsidis, L.v.S., Syn. Car. 493, Lk. p. 74, and Pennsylvania—entirely distinct.
(493. 8. [Puccinia] Heliopsidis Sz.
P. rather irregular, aggregated, surrounded by the epidermis, chestnut brown, spores oval, elongate, long pedicelled, bilocular.
Frequent on dried leaves of Heliopsis, also on Vernonia.—Cells of the spores equal, septum situated exactly in the middle of the spore.)

Represented only by an empty packet, labelled "Puccinia *Heliopsidis* LvS."

The rust on *Heliopsis* is still known by the name given to it by Schweinitz. It has only been found on *H. helianthoides* (L.) Sweet. Although given as "frequent," yet it is represented by only five collections in the Arthur herbarium, all from the Mississippi

region, three with æcia, one with uredinia, and only one showing telia. The species must be local, although widespread.

2925. 21. P. Verbesinæ, L.v.S., Syn. Car. 496, Lk. p. 74, not yet in Pennsylvania—good species.

(496. 11. [Puccinia] Verbesinæ Sz.

P. punctiform, sparse, fuscous black, spores ovate, bilocular, pedicel short.

On flourishing leaves of Verbesina, Sigesbeckia (Richweed).—Spores narrower at the apex than at the base, bilocular: cells equal. Not surrounded by the epidermis.)

Represented by an empty packet, which is labelled on the inside "Dicæoma Verbesinæ Salem," and on the outside "Puccinia *Verbesinæ* LvS Salem."

Schweinitz's name still holds good for the *Verbesina* rust of the region he explored. It most likely does not occur on *Siegesbeckia* (richweed), on which no rust has yet been found.

*2926. 22. P. Vernoniæ, L.v.S., very common on Vernonia, Bethlehem.

P. without spots. By the rather pulvinate sori and by the beautiful rusty color of the spores it differs from P. Helianthi. It occurs also occasionally on Helianthus.

Represented by an empty packet, labelled "Puccinia *Vernoniæ* LvS in Heliant ferrugin."

This is without doubt the leaf form of the common *Vernonia* rust, the stem form of which Schweinitz had already named *P. bullata* (no. 2919). The rust does not occur on *Helianthus*, although occasionally the *Helianthus* rust simulates the one on *Vernonia*.

2927. 23. P. Xanthii, L.v.S., Syn. Car. 500, Lk. n. 23. Also frequent on leaves of Xanthium in Pennsylvania. Beautiful and conspicuous from a distance. Sori usually concentric and aggregated in the center of the spot.

(500. 15. [Puccinia] Xanthii Sz.

P. spots delicate, orbicular, pale, beneath fuscous brown with a pale margin, spores oblong, bilocular, pedicellate.

On lower surface of the leaves of Xanthium strumarium, in sandy places. Beneath it shows at first pale vesicles resembling the cells of the leaf, these being broken and encircled by the epidermis, the spores appear in a coherent fuscous pustule, yellow under a lens, the pedicel longer than the spore.)

Represented by an original packet, containing part of one leaf about 3 by 6 cm., bearing many groups of telia, which is labelled "Puccinia *Xanthii* LvS Sal & Beth."

A very common short-cycle rust still designated by Schweinitz's name.

*2928. 24. P. Helenii, L.v.S., rather rare, but prominent, on leaves of Helenium autumnale, Bethlehem.

P. spots golden yellow, expanded, sori pulvinate, sparse, and close to each other, convex, at first brown, later beautifully chestnut. Spores rather large, compact.

Represented by a packet containing the tip of a stem, about 2 cm. long, with six small, sessile leaves attached, together with parts of three maturer, lanceolate leaves, the largest 2.5 cm. broad and 7 cm. or more long. The packet is labelled "Puccinia *Helenii* LvS Bethl." An empty duplicate packet is labelled "2 Puccinia *Helenii* LvS."

A careful study of this material leaves little doubt that the host is *Aster salicifolius* Lam., and that the rust is the common *Puccinia Asteris* Duby. The leaves of *Helenium* have a peculiar lower surface due to a sparse pubescence, quite unlike the smooth lower surface of the material in the packet, or of *Aster salicifolius* and of similar lanceolate-leaved species of the genus *Aster*. From an original specimen in the Fries Herbarium at Upsala, Lagerheim (*Tromsö Mus. Aarsh.*, 17:60, 1894) has given detailed characters as a good species, not remarking any error in the host. Even if the host had been *Helenium*, yet the rust would undoubtedly have proven to be the same species that occurs on *Aster*, judging by the description given and the relationship and characteristics of the hosts.

*2929. 25. P. Silphii, L.v.S., sent from Carolina, on leaves of S. trifoliatum, by my friend Denke.

P. spots rather small, purple. Sori thick, pulvinate, confluent, aggregated, black. Spores compact, concolorous.

Represented by four small fragments of leaf, the smallest one, 1.5 cm. long, bearing a group of telia. The packet is labelled "Puccinia *Silphii* LvS in Sylph trifoliat Denke."

Both rust and host appear identical with those respectively that go under the same names at the present time.

*2930. 26. P. Asteris, L.v.S., a handsome species, frequent on leaves of A. paniculatus, Bethlehem.
P. spots flattened, bullate, yellow, not widely expanded. Sori very dense, subconcentrally placed, beautifully fuscous. Spores rather loose, concolorous.

Represented by a packet containing a short stem with three leaves attached and also by ten much crumpled, similar, ovate-lanceolate leaves, all with long, slender petioles, and all sparsely bearing telia. The packet is labelled "Cæoma (Ur) *Asterum* LvS Bethl in Ast. paniculat," with the first two words crossed out and "Puccinia" substituted.

The leaves are doubtless *Aster cordifolius* L., and the rust is the short-cycle form first given the name *Puccinia Asteris* by Duby in 1830, two years before the Schweinitz name was published. Doubtless the early collection on *Aster paniculatus,* this being its most common host, was entirely given away, leaving only a later collection on *A. cordifolius*.

*2931. 27. P. Kuhniæ, L.v.S., common on the leaves of Kuhnia, Bethlehem.
P. without any spots. Sori amphigenous, pulvinate, densely aggregated, blackish brown. Spores rather large, loose, long pedicelled. A Phragmidium?

Represented by an original packet labelled on the inside "Uredo Kuhniæ in K. eupator Bethl & Salem," with "Uredo" crossed out and "Puccinia" substituted, and on the outside "Puccinia Kuhniæ LvS Beth." The packet contains a tiny fragment, 2 by 3½ mm., bearing a few large telial sori. The peculiar glands and hairs make the host unmistakable, and the amphigenous sori with their ellipsoid teliospores fully justify the record.

The rust is not common eastward, Schweinitz's record being the only one known to the writers east of Wisconsin and Indiana, although in the middle west, especially between Illinois and the foothills of Colorado, it is not infrequent. In the Carolina list *Kuhnia* is mentioned as host for a rust (see no. 2844), and the earliest label on the packet reads "Bethl & Salem," but the packet was probably

not labelled until after Schweinitz became a resident of Pennsylvania. We may safely assume that the packet with its fragment represents a collection made at Bethlehem, Pa. Unless this were true the asterisk before the number would have to be considered erroneous, and the omission of "Syn. Car. 478" unintentional. Furthermore, if Salem were the place where the collection was made, the record would have been *Salem & Bethl.*, as may be seen under nos. 2832, 2846, 2875, 2888, 2917, 2919, 2927, etc. Some observation at Salem may have been in mind, but with no specimen preserved.

*2932. 28. P. investita, L.v.S., frequent, observed with Æcidium gnaphalitatum on the tomentose leaves of Gnaphalium polycephalum, Bethlehem. Always hidden by the tomentum.

P. without spots; sori minute, sparse, roundish, very black, scarcely showing at first through the tomentum, sometimes aggregated-confluent. Spores compact, very dark. Surface of the sori as if furrowed.

Represented only by an empty packet labelled "Puccinia *investita* LvS in avers pag Gnaphalii polycephali cum Æcidio vulgari Beth." There is no reason to doubt that this record applies to the rust still passing under Schweinitz's name, *P. investita*, which possesses æcia and telia, and is identical with no. 2873, and now better called *P. gnaphaliata* (Schw.) Arth. & Bisby.

2933. 29. P. Galii, L.v.S., Syn. Car. 499, Lk. p. 76, a rare species but sufficiently distinct—not a Sclerotium.

(499. 14. [Puccinia] Galii Sz. (near Sclerotium).

P. erumpent, globose-ovate, dark fuscous, spores clavate, biloc-ular, short pedicelled.

On living leaves of Galium purpureum, but more perfect on dead ones, then a line long.—Tubercle-like it pushes up the epidermis, which surrounds it. Spores a little darker in color than those of Puccinia graminis.)

Represented only by an empty packet, labelled on the inside "Dicæoma Galii Salem," and on the outside "Puccinia *Galii* LvS Salem." There is no specimen of this number at Philadelphia, or in the Herb. Curtis at Harvard University or in the Michener Collection at Washington.

It is particularly unfortunate that no specimen is available to substantiate the record, as there is no other record of a *Galium* rust having been collected in North Carolina. The most southern collection in the Arthur herbarium is that of *Puccinia punctata* Link on *G. triflorum* made by Mrs. Emily Arthur at Salt Sulphur Springs, W. Va., in 1914, a locality on the opposite slope of the Allegheny Mountains to the northwest from Salem, N. Car. There is no other record than Schweinitz's of a rust on *G. purpureum* Walt., now referred to *G. pilosum* Ait., although it would not be an unlikely host for *P. punctata*. The tubercle-like emergence of the sori and their distinctly blackish color are sufficiently characteristic of the telia of *P. punctata* Link to make it probable that Schweinitz had this species in hand, although it must be a rare fungus in the Carolina flora.

*2934. 30. P. Myrrhis, L.v.S., on leaves and stems of Myrrhis procumbens, Bethlehem.

P. without spots. Sori dense, minute, surrounded by the ruptured epidermis, pulvinately applanate. Spores very loose, golden brown.

Represented by a scanty specimen, consisting of numerous very small fragments showing a few pale telia, in the original packet, which is labelled "Puccinia *Myrrhis procumb* LvS Beth."

Both urediniospores and teliospores are present in the specimen, and are characteristic for the species now called *Puccinia Pimpinellæ* (Str.) Mart. The host is clearly as named by Schweinitz *Chærophyllum procumbens* (L.) Crantz (*Myrrhis procumbens* Spreng.).

*2935. 31. P. Bullaria, Lk. n. 32, on stems of Hyssopus nepetoides, rare, Bethlehem.

Represented only by an empty packet labelled "Puccinia caulincola in Hyssop. nepet. Bet," with second word crossed out and "bullaria" written in.

There is a specimen in the Michener Collection at Washington exactly answering the requirements of this number. It is a piece of smooth stem 4 cm. long, split lengthwise and originally 3 mm. in diameter. Protruding from a longitudinal fissure 2 cm. in length is a fungus-like growth, brown and bullate, that may be the early

stage of some ascomycete but is certainly not a rust. No spores were found. As the host is a labiate and not an umbellifer, Link's name could not in any case be applicable.

*2936. 32. P. anemones, Lk. n. 33, very rare on leaves of A. quinquefolia, but most distinct, Bethlehem.

Represented only by an empty packet, which is labelled inside "Dicæoma punctata Deetw," with the later addition above of "Puccinia anemones," and on the outside "2 Puccinia Anemones Beth Deetwyler," and also a word preceding the last one which is not wholly legible.

There is practically no doubt that this number covers the rust on the host as stated, now called *Polythelis fusca* (Pers.) Arth.

2937. 33. P. solida, L.v.S., Syn. Car. 486. [as P.] Anem. virginian, frequent on leaves of Anemone virginiana, Salem and Bethlehem.

P. without spots. Sori sparse, rather large, so very compact that they appear solid, black. Spores at length somewhat loosened. Sori dispersed over the whole leaf, at first yellow and more or less impressed.

(486. 1. [Puccinia] Anemones Virginianæ Sz.

P. punctiform, sparse, chestnut brown, spores clavate, attenuate into a short pedicel, bilocular.

Spores under the lens yellowish-white; they pass into the pedicel so that it is not possible to distinguish where they begin.)

Represented by an empty packet, labelled "Puccinia solida LvS in Anem. Vir."

A widespread and well-known species, still bearing the earlier name here given.

2938. 34. P. circææ, Lk. 43, Syn. Car. 491, common, and Bethlehem.
(491. 6. [Puccinia] Circææ, frequent on leaves of Circæa.)

Represented by a packet containing parts of three leaves, the best preserved being about 3 by 5 cm., and labelled "2 Puccinia Circææ Germ & B & S," with cancellation marks across "Germ." Two of the leaves are faded and pressed smooth, the third is natural green and crumpled by drying. The rust and host, undoubtedly *C. Lutetiana*, are common and widespread, although no other collection of the rust is yet known so far south.

2939. 35. P. aculeata, L.v.S., Syn. Car. 489. P. podophylli, likewise common on Podophyllum [in Pennsylvania]. Very distinct on account of the aculeate spores.

(489. 4. [Puccinia] Podophylli Sz.

P. rather large, subconcentric, chestnut black on yellowish spots, spores oblong, bilocular, aculeate.

Here and there on leaves of Podophyllum.—Spores oval, under a lens yellowish, the points prominent, straight. Pedicel not distinct, very short.)

Represented only by an empty packet, labelled "Puccinia aculeata LvS in Podoph Sal & B."

Owing to Schweinitz's slip of the pen in calling the spores of *Æcidium Podophylli* (no. 2888) "bilocular," Link transferred that form to the genus *Puccinia,* which necessitated a new name for the present form, so he made a descriptive name from a very distinctive character (l. c., p. 79). Schweinitz adopts the name, but evidently considers himself responsible for the species, and, as in other such cases, does not cite Link's work. Schweinitz's earlier name is still in use for this rust.

2940. 36. P. Lespedezæ procumbentis, L.v.S., Syn Car. 497, Lk. p. 83, extraordinary species, and in Pennsylvania.

(497. 12. [Puccinia] Lespedezæ procumbentis Sz.

P. rather small, subpunctiform, sparse, somewhat fuscous, erumpent, spores oblong, bilocular.

Here and there on leaves of Lespedeza procumbens.—It lifts the epidermis of the lower surface of the leaf into blisters, which ruptured are white, pellucid. Spores with septum situated exactly in the middle of the spore, and the pedicel (white, rather long) is distinct from the spore.)

Represented only by an empty packet, labelled "Puccinia *Lespedezæ procumbent* LvS Salem."

The senior author in his first publication on the subject of rusts (*Amer. Nat.,* Jan., 1883, pp. 77–78) pointed out that doubtless Schweinitz was led into the error of describing the spores as bilocular by looking at the dry spores under a magnification of about seventy-five diameters. At any rate the microscopic details in Schweinitz's description can be attested in this way. The greatly thickened wall at the upper part of the teliospore, often equal to half the spore's length, under these conditions takes on the appear-

ance of an upper cell separated from the lower by a transverse septum. In reality the teliospores are one-celled, and the rust belongs under the genus Uromyces, as *U. Lespedezæ-procumbentis* (Schw.) M. A. Curt.

2941. 37. P. Lespedezæ violaceæ, L.v.S., Syn. Car. 498, Lk. p. 83, much more frequent on L. violacea than on L. polystachya, also in New Jersey.

(498. 13. [Puccinia] Lespedezæ polystachyæ Sz.

P. rather small, punctiform, surrounded by the epidermis, black shining, spores oblong, attenuate at both ends, somewhat bilocular.

Frequent on the lower surface of the leaves.—Surrounded by the epidermis. Spores more elongate and attenuate into the pedicel, septum scarcely visible, it appears vaguely now near the apex of the spore, again lower. Color of the spores, under a lens, yellow.)

Represented by neither specimen nor original packet. The rust is an abundant one, and is considered by all recent mycologists to be identical with the preceding, *Uromyces Lespedezæ-procumbentis* (Schw.) Curt., and to be both on *L. hirta* (L.) Hornem. (*L. polystachya* Michx.) and *L. violacea* (L.) Pers.

The elaborate but elusive description of this species, when taken in connection with that of the preceding number, illustrates the imperfect equipment possessed by Schweinitz and others of his time for the study of microfungi, and leaves us astonished at the large measure of success attained. The present number also illustrates the futility of long and cumbersome specific names for correctly designating a species. Before a decade had passed Schweinitz said that the rust which he specifically limited to *Lespedeza polystachya* was found by him "much more frequent on *L. violacea.*" How much better it would have been to have designated this rust as *P. affinis,* or by some such simple appellation, and avoided bestowing a name that would be burdensome to other mycologists.

*2942. 38. P. Phaseoli trilobi, L.v.S., on leaves of P. trilobus sent from New York. Appears related to P. fabæ.

P. sori minute, hypophyllous, partly covered by the epidermis. Spores black, spots none.

Represented by an empty packet, which is labelled "Puccinia *Phascoli* Newyk in Phaseolo trilobo." There appears to be no

doubt that this number belongs under *Uromyces appendiculatus* (Pers.) Fries, and on *Strophostyles helvola* (L.) Britton (*P. trilobus* Michx.).

*2943. 39. P. Fabæ, Lk. n. 45, on leaves of V. faba, Nazareth.

Represented by neither specimen nor packet. Doubtless the rust was *Uromyces Fabæ* (Pers.) DeBary, and on the host named, at that time a plant more often cultivated in America than at present.

*2944. 40. P. Hyssopi, L.v.S., on leaves of H. scrophulariæfolius, Bethlehem occasionally.
P. spots yellowish, effuse. Sori aggregated, compact, fuscous, somewhat circinate and undulately confluent with each other, at first blackish, small but occurring copiously upon the leaf. Spores fuscous, at length rather lax.

Represented by a packet, containing a stem, 4 cm. long, with two opposite and petioled leaves attached, and by parts of three other leaves, the largest being 2.5 cm. wide, bearing many groups of telia. The packet is labelled "Puccinia *Hyssopi* scrophul LvS Beth 26."

The host is now placed under *Agastache,* as *A. scrophulariæfolia* (Willd.) Kuntze, and the rust is identical with *P. verrucosa* (Schultz) Link.

*2945. 41. P. Potentillæ, L.v.S., not Phragmidium, Lk., on mature leaves of P. canadensis, on lower surface, Bethlehem.
P. sori minute. Spores fuscous, at length black, erumpent, short pedicelled. Spots almost disappearing.

Represented by an empty packet, labelled "Puccinia *Potentillæ,*" with one other word, not deciphered.

The rust is undoubtedly the one often called *Phragmidium Potentillæ-canadensis* Diet. It was transferred to the genus *Kuehneola* by the senior author some time since, and again very recently to the genus *Frommea,* under which it is *F. obtusa* (Strauss) Arth.

*2946. 42. P. Ari triphylli, L.v.S., on lower surface of the leaves of A. triphyllum, Bethlehem.
P. spots pale, very broad, on the margins of the leaves. Sori large,

often confluent, at first covered by the epidermis, soon ruptured. Spores brown fuscous, loosely attached and Uredo-like but nevertheless a true Puccinia.

Represented by a packet containing two large leaflets, 8 by 15 cm., bearing several loose groups of telia, and labelled "Puccinia *Ari triphylli* Mauch Chunk."

This number is now called *Uromyces Caladii* (Schw.) Farl., and on *Arisæma triphyllum* (L.) Schott (*Arum triphyllum* L.), other stages of the life cycle being listed under nos. 2839, 2860 and 1861.

Genus 213. Phragmidium.

It is worthy of note that I have never met with a Phragmidium in America on the leaves of Rosa or Rubus, but the following very common species without doubt belongs here.

2947. 1. P. Hedysari, L.v.S., Syn. Car. 503, frequently occurs on leaves of H. paniculatum and others, Bethlehem and Salem.

P. sori minute but thickly scattered over the whole leaf, resting upon the epidermis. Spores long pedicelled, pedicel articulate, pellucid, remainder opaque, ovate, obtuse, not cylindric, obscurely septate, not constricted at the articulations, fuscous black.

(503. 18. [Puccinia] Hedysari paniculati Sz.

P. punctiform, sparse, fuscous, spores ovate-globose, fuscous, pedicel very long, filiform, pellucid.

Frequent on the under face of the leaves of Hedysarum paniculatum. I see no septum in the spore. Pedicel filiform, pellucid.)

Represented only by an empty packet, labelled on the inside "Dicæoma *Hedysari* paniculat Salem," and on the outside "Puccinia *Hedysari* panic Salem."

If the genus *Uromyces* had been in use at the time, Schweinitz undoubtedly would have placed this species under it, certainly at first, for he says he could see no septum. What his idea of the genus *Phragmidium* was, it is now difficult to say, but the senior author has explained in the paper referred to under no. 2940, that when the teliospores are seen dry under low magnification "the pedicels being delicate cylinders collapse and twist like a ribbon, and what appear to be three or four joints in each pedicel are very dis-

tinctly shown" (l. c.), hence Schweinitz says "pedicel articulate." The earlier specific name is still retained, the species being *Uromyces Hedysari-paniculati* (Schw.) Farl., and on *Meibomia paniculata* (L.) Kuntze (*Hedysarum paniculatum* L., *Desmodium paniculatum* DC.).

Note.—The genera numbered 214–246 include the remainder of Series I and all of Series II–IV. Under Series IV, Sporodermei, the following species belong with the rusts.

Genus 241. Seiridium.

*3084. 1. S. marginatum, Lk. p. 126, n. 1. Our plant, very common on Rosa corymbosa growing in inundated places, agrees exactly with Nees's illustration and description. But it is not the same in size; for usually it occurs on branches, living or half alive, with huge sori, very thick, two inches, encircling the branches, and often many sori joined together. Spores so large that they are clearly visible to the naked eye, or at least through a lens of very low power.

Represented by a mounted specimen, consisting of three rose stems, 4–6 cm. long and 6 mm. thick, well provided with large, blackish sori. No original packet was to be found. The rust is clearly the very distinctive *Earlea speciosa* (Fries) Arth. (*Phragmidium speciosum* Fries), on *Rosa carolina* L. (*R. corymbosa* Ehrh., *R. pauciflora* Muhl.).

*3085. 2. S. Similacis [typographical error for Smilacis], L.v.S., here and there erumpent from the stems of Smilax caduca and other species, Bethlehem.

S. sori very long, confluent, yet much smaller, and not so thick [as in the preceding species]. Spores cylindric, dark fuscous, obtuse, pedicels very long, contorted, white.

Represented by neither specimen nor packet at Philadelphia. In the Michener Collection at Washington, there are two stems, one 5 cm. long by 5 mm. in diameter, and the other 4 cm. long and 3 mm. in diameter, with many long weak prickles and well covered with masses of telia. They are mounted and are labelled "Schw. Mss. Seiridium obtusiusculum on rosa, Smilacis Beth. ex Herb. Schw.," but without number.

The host is undoubtedly some species of *Rosa*, and may well be *R. virginiana* Mill., while the rust is undoubtedly *Earlea speciosa* (Fries) Arth. The appearance of this material corresponds to Schweinitz's description.

Genus 243. Gymnosporangium.

*3094. 1. G. Juniperi, Lk. p. 127, n. 1. Not frequent, but very distinct from Podisoma Juniperi, found near Easton, Pennsylvania, on Juniperus virginiana.

Represented by a mounted specimen, consisting of a woody stem, 11 cm. long and 8 mm. in diameter, with a fusiform swelling from which the sori have dropped away. The stem was broken into two unequal parts before mounting. No original packet has been found.

The rust is that of *Gymnosporangium germinale* (Schw.) Kern (*G. clavipes* C. & P.), of which the æcial form is given under 2904.

Genus 244. Podisoma.

*3095. 1. P. Juniperi, Link, p. 127, found by me on a single Junip. Sabina in this region—copiously developed.

Represented by a mounted specimen, consisting of a four-branched, woody stem, 5 cm. long, having a few subulate leaves each about 5 mm. long, and with a few, slender, corneous sori remaining, most of the telia having dropped out or been eaten by insects. No original packet has been found.

The rust is that of *Gymnosporangium clavariæforme* (Jacq.) DC., and the host is most likely *Juniperus communis* L., being the common juniper, and not the red cedar as the name used by Schweinitz would seem to indicate.

3096. 2. P. macropus, L.v.S., Lk. p. 127 [error for 128], wrongly under Gymnosporangium [in earlier work]. In the parts of North Carolina best known to me a rather rare fungus. In Pennsylvania very common, particularly affecting Juniperus virginiana that has suffered by much pruning, and commonly known by the name "Cedar apple," under which name it is offered in the market as a powerful, though imaginary, vermifuge remedy. Link expresses regret that I did not examine the structure of the underlying sporidochium. Now such things as were not dis-

cussed by me, upon this point, I gladly add here. In the first place this very puzzling base ought by no means to be regarded as a sporidochium, if by this term it is intended to designate the structure so called in Podisoma Juniperi. That body, which is gelatinous and composed of the interwoven stalks of the spores, corresponds exactly with the tremellose ligules of our *P. macropus.* On the other hand the basilar capitulum, the part in question, is of a wholly different nature. Never, moreover, is it wanting. In fact it always constitutes the first evidence for our fungus; showing itself in the earliest stage on the slender branches of J. virginiana of the size of a rather large pinhead, enlarging gradually, usually without altering the affected branch, and swelling into a more or less regularly turbinate and plicate capitulum,—reaching a diameter of an inch, or even two inches. Its texture when dry and old is fibrous-corky, as in Fistulina but not succulent-fleshy, as if composed of fibers radiating from the broadly obconic pedicel—otherwise presenting at the time a somewhat woody condition. The immature capitulum, on the other hand, may be easily cut like an apple, or even eaten. Externally it has an epidermis-like cortex from lilac to fuscous purple in color, entirely juiceless like the skin of an apple. Over the whole surface appear regular pits, polygonal or mostly pentagonal, at first merely applanate, soon impressed and umbonate; finally during wet weather, the cortex rupturing in the center, the ligular gelatinous sporidochia an inch long are protruded—bedecking all the trees during a rainy spring night as it were with the richest crop of ripe oranges. If the wet weather continues for some days, the ligules in this condition begin to dissolve. In the sunshine, however, the ligules are soon dried out—and they never again revive. The capitulum persists through the year. Old specimens are internally not unlike excrescences of trees. Yet never can a capitulum be found without ligules, at least at first, nor ligules without a capitulum. It is usual where trimmed juniper trees are forced artificially into a pyramidal or other shape for this fungus to attack them in incredible abundance—but according to my observations carefully made during ten years, such trees are not destroyed, nor do they appear even to be harmed. There are therefore many people, and not a few educated ones, who thoroughly believe this fungus to be the inflorescence or genuine fruit of the juniper. I am thoroughly convinced by careful study that the base has nothing to do with insect-work. Yet it is not to be positively asserted that it is fungous. It seems to me to be a very abnormal growth, concerning which there is nothing more to say—but it should be further studied.

Note.—The structure of the base of this fungus in its young state before it protrudes the gelatinous ligule, accidentally omitted in its proper

place, is as follows. The texture of the base at that time inside is like the flesh of a ripe apple—if cut into slices with a knife—the color is greenish white as in a green apple; oozy-cellular, apparently radiating from the stalk. The green color soon changes to tawny orange—and then may be seen a few white branching fibers radiating from the stalk. As soon as the ligules are protruded on account of rainy weather, the base grows no more; but if the weather is not rainy the base enlarges day by day. The epidermis of the younger sporidochia, before their full maturity, has a somewhat filamentous-scaly texture, and the thickness of the skin of an apple. In their mature condition the ligules are covered with sporidia, just as in P. Juniperi—but the ligules are usually longer and not conic, often subflexuous and more attenuate toward the apex.

The asterisk was probably omitted from this number by mistake. Schweinitz evidently had many doubts about the true nature of this fungus and its generic position. In the North Carolina list he did not add "Sz." to the name, nor did he supply a technical diagnosis, as in the case of his other new species. This may have been an accidental omission while in editorial hands, but is more likely an indication that Schweinitz hesitated regarding the best procedure.

(504. 1. [Gymnosporangium] Juniperi Virginianæ.

N. B. Wholly to be separated, I believe, from the genus Puccinia, and to constitute with Podisoma Juniperi, on the European Sabina, a new genus, even of this order? (that Podisoma Juniperi should be reunited with Gymnosporangium Juniperi, Nees himself affirms). In both the form and substance of the gelatinous ligule, loaded with spores, it agrees with the European fungus mentioned; but ours has a remarkable base, a thing never seen in the European. This base, as I have termed it, a somewhat corky-fleshy body, is quite like the flesh of Boletus hepaticus, even in color, and is borne on an obconic stalk, attached by its tip to the slender branches of our cedars (Juniperus Virginiana) at the very top of the trees;—from this it changes into a hard (almost woody) capitulum, expanded, with incurved margins, marked with many pits, from which in wet weather are protruded the ligules, which when they have been dropped leave the pits empty. The color of the base is flesh-gray, of the fungus when fruiting and extruding the ligules strongly greenish golden, attracting the eye from a distance. Also, the capitulum is pendulous, and has a diameter of two to four inches.

Spores covering the external surface of the ligules, linear-oblong, somewhat curved, two-celled, when again wet after drying yellowish, exactly like Nees's illustration characterizing Gymnosporangium.)

Represented only by a mounted specimen, consisting of three galls, each about 1.5 cm. broad, one of which bears numerous projecting telia, 5 mm. long, the other two much eaten by insects. The fungus is one of the best known American rusts, now generally listed under the name first given by Schweinitz. Why Link changed the name, having no information except that supplied in Schweinitz's Carolina list, and not having seen a specimen, is not evident. Schweinitz accepts Link's substitute name, but places the species under the genus *Podisoma* for reasons which he states.

Note.—The above account includes all numbers pertaining to rusts in Schweinitz's "Synopsis Fungorum in America Boreali." It also includes all numbers possibly relating to rusts, given under *Ædidium, Uredo, Puccinia* and *Gymnosporangium* in his "Synopsis Fungorum Carolinæ Superioris" except two.

No. "460. [*Uredo*] *confluens* β., rare on softer leaves, e. g. *Veratrum* album," is represented by no specimen or original packet at Philadelphia, and the identity of the collection must be left undecided. No rust is known that would answer the requirement.

No. "475. [*Uredo*] *Betæ,* α and β, here and there on leaves of the garden beet and on *Ipomœa panduranæ,*" is represented by no specimen or original packet. The most probable suggestion points to species of the Phycomycetous genus *Albugo* to account for this number.

SCHWEINITZ'S UREDINALES IN SYSTEMATIC ARRANGEMENT.

Coleosporiaceæ.

Coleosporium Ipomœæ (Schw.) Burr. (*Uredo Ipomœæ* Schw., *Cæoma Ipomœæ* Link).

On *Ipomœa pandurata* L., II, III, North Carolina, *2824.*

Coleosporium Elephantopodis (Schw.) Thüm. (*Uredo Elephantopodis* Schw., *Cæoma Elephantopodis* Link).

On *Elephantopus tomentosus* L., II, North Carolina, *2825.*

(Coleosporium Vernoniæ Berk. & Curt.

On *Vernonia noveboracensis* (L.) Willd., North Carolina, *2826.*)

COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. (*Uredo Solidaginis* Schw., *Cæoma Solidaginis* Schw.).

On *Solidago altissima* L., II, North Carolina, *2826*.
Solidago rugosa Mill., II, Pennsylvania, *2826*.
Solidago sempervirens L., II, New York, *2826*.
Solidago serotina Ait., II, Pennsylvania, *2826*.

COLEOSPORIUM TEREBINTHINACEÆ (Schw.) Arth. (*Uredo Terebinthinaceæ* Schw., *Cæoma Terebinthinaceæ* Schw.).

On *Silphium terebinthinaceum* Jacq., *2827*.

COLEOSPORIUM HELIANTHI (Schw.) Arth. (*Cæoma Helianthi* Schw.).

On *Helianthus giganteus* L., ii, III, Pennsylvania, *2828*.

UREDINACEÆ (*Melampsoraceæ*).

MELAMPSORA MEDUSÆ Thüm.

On *Populus dilatata* Ait. (*P. italica* Moench), II, Pennsylvania, *2855*.

MELAMPSORA BIGELOWII Thüm.

On *Salix nigra* Marsh., II, Pennsylvania, *2856*.

PUCCINIASTRUM AGRIMONIÆ (Schw.) Tranz. (*Cæoma Agrimoniæ* Schw.).

On *Agrimonia parviflora* Soland., II, North Carolina (Pennsylvania), *2835*.

PUCCINIASTRUM MYRTILLI (Schum.) Arth. (*P. minimum* Arth., *Uredo minima* Schw., *Cæoma Azaleæ* Schw.).

On *Azalea nudiflora* L., II, North Carolina, Pennsylvania, *2838*.

KUEHNEOLA UREDINIS (Link) Arth. (*Phragmidium albidum* Lagerh.).

On *Rubus idæus* L., II, Pennsylvania, *2833*.

Melampsoropsis Pyrolæ (DC.) Arth. (*Cæoma pyrolatum* Schw., *Ædidium pyrolatum* Schw., *Chrysomyxa Pyrolæ* Rostr.).
On *Pyrola uliginosa* Torr. (*P. rotundifolia* Am. Auct.), II, New York, *2893*.

Hyalopsora Aspidiotus (Peck) Magn.
On *Phegopteris Dryopteris* (L.) Fee (*Aspidium obtusum* Muhl.), II, New York, *2836*.

Cronartium Quercus (Brond.) Schröt. (*Peridermium Cerebrum* Peck).
On *Pinus virginicus* Mill. (*P. inops* Sol.), I, Pennsylvania, *2903*.

Peridermium intermedium Arth. & Kern.
On *Pinus* sp., I, North Carolina, *2903*.

Ædidiaceæ (*Pucciniaceæ*).

Ravenelia epiphylla (Schw.) Diet. (*Sphæria epiphylla* Schw.).
On *Cracca virginiana* L. (*Tephrosia virginiana* Pers., *Galega virginiana* L.), III, North Carolina, *1474*.

Tranzschelia punctata (Pers.) Arth. (*Cæoma hepaticatum* Schw., *Ædidium hepaticatum* Schw., *Puccinia Prunispinosæ* Pers.).
On *Hepatica Hepatica* (L.) Karst. (*H. triloba* Chaix., *Anemone Hepatica* L.), I, Pennsylvania, *2878*.

Polythelis fusca (Pers.) Arth. (*Puccinia Anemones* Pers.).
On *Anemone quinquefolia* L., III, Pennsylvania, *2936*.

Polythelis Thalictri (Chev.) Arth. (*Cæoma Thalictri* Schw., *Puccinia Thalictri* Chev.).
On *Thalictrum polygamum* Muhl. (*T. Cornuti* Auct.), III, New York, *2849*.

?Phragmidium imitans Arth.
On *Rubus idæus* L., I, Pennsylvania, *2854*.

FARLEA SPECIOSA (Fries) Arth. (*Sciridium marginatum* Schw. not Nees, *S. Smilacis* Schw., *Phragmidium speciosum* Cooke).

On *Rosa carolina* L. (*R. corymbosa* Ehrh., *R. pauciflora* Muhl.), I, North Carolina, *2832*; III, Pennsylvania, *3084*.

Rosa virginiana Mill., III, Pennsylvania, *3085*.

FROMMEA OBTUSA (Strauss) Arth. (*Puccinia Potentillæ* Schw., *Phragmidium Potentillæ-canadensis* Diet., *Kuehneola obtusa* Arth.).

On *Potentilla canadensis* II_1, II_2, North Carolina, Pennsylvania, *2834*; III, Pennsylvania, *2945*.

KUNKELIA NITENS (Schw.) Arth. (*Æcidium nitens* Schw., *A. luminatum* Schw., *Cæoma luminatum* Link).

On *Rubus Enslenii* Tratt., III, North Carolina, *2887*.

Rubus sp., III, Pennsylvania, *2887*.

GYMNOSPORANGIUM MYRICATUM (Schw.) Fromme (*G. Ellisii* Farl., *Cæoma myricatum* Schw., *Æcidium myricatum* Schw.).

On *Myrica cerifera* L., I, New York, *2894*.

GYMNOSPORANGIUM JUNIPERI-VIRGINIANÆ Schw. (*G. macropus* Link, *Podisoma macropus* Schw., *Cæoma pyratum* Schw., *Æcidium pyratum* Schw.).

On *Malus coronaria* (L.) Mill. (*Pyrus coronaria* L., *P. angustifolia* Ait.), I, Pennsylvania, *2896*.

Malus Malus (L.) Britton (*Pyrus Malus* L.), I, Pennsylvania, *2899δ*, *2900*.

Juniperus virginiana L., III, North Carolina, Pennsylvania, *3096*.

GYMNOSPORANGIUM GLOBOSUM Farl.

On *Crataegus punctata* Jacq., I, Pennsylvania, *2899 α*.

Pyrus communis L., I, North Carolina or Pennsylvania, or both, *2900*.

Gymnosporangium hyalinum (Cooke) Kern (*Rœstelia hyalina* Cooke).

On *Cratægus viridis* L. (*C. arborescens* Ell.), I, North Carolina, *2899β*.

Gymnosporangium trachysorum Kern.

On *Cratægus Oxyacantha* L., I, Pennsylvania, *2899γ*.

Gymnosporangium botryapites (Schw.) Kern (*G. biseptatum* Ellis, *Cœoma botryapites* Schw., *Ceratites botryapites* Schw.).

On *Amelanchier canadensis* (L.) Medic. (*Aronia Botryapium* Pers.), I, Pennsylvania, *2902*.

Gymnosporangium germinale (Schw.) Kern (*G. clavipes* C. & P., *Cœoma germinale* Schw., *Peridermium germinale* Schw.).

On *Cratægus* sp., I, Pennsylvania, *2904*.

Juniperus virginiana L., III, Pennsylvania, *3094*.

Gymnosporangium clavariæforme (Jacq.) DC.

On *Juniperus communis* L., III, Pennsylvania, *3095*.

Uromyces Junci-effusi Syd. (*Puccinia Junci* Schw.).

On *Juncus effusus* L., II, III, Pennsylvania, *2906*, *2913*.

Uromyces Caladii (Schw.) Farl. (*Æcidium Caladii* Schw., *A. aroidatum* Link, *A. dracontionatum* Schw., *Uredo Caladii* Schw., *Cœoma Caladii* Schw., *C. aroidatum* Link, *C. Arivirginici* Schw., *C. dracontionatum* Schw., *Puccinia Aritriphylli* Schw.).

On *Arisæma triphyllum* (L.) Schott (*Arum triphyllum* L.), III, Pennsylvania, *2946*.

Muricauda Dracontium (L.) Small (*Arum Dracontium* L., *Arisæma Dracontium* Schott), I, North Carolina, Pennsylvania, *2861*.

Peltandra virginica (L.) Kunth (*Arum virginicum* L.), II,

North Carolina, Pennsylvania, *2839*; I, North Carolina, *2860*.

Uromyces houstoniatus (Schw.) Sheldon (*Cœoma houstoniatum* Schw., *Æcidium houstoniatum* Schw.).

On *Houstonia cærulea* L., I, Pennsylvania, *2891*.

Uromyces Hyperici-frondosi (Schw.) Arth. (*Æcidium Hyperici-frondosi* Schw., *A. hypericatum* Schw., *Cœoma Hyperici* Schw., *C. hypericatum* Link).

On *Hypericum prolificum* L. (*H. frondosum* Michx.), I, North Carolina, *2883*.

Hypericum sp., II, North Carolina, *2842*; I, Pennsylvania, *2883*.

Uromyces pedatatus (Schw.) Sheldon (*U. Andropogonis* Tracy, *Æcidium pedatatum* Schw., *A. sagittatum* Schw., *Cœoma pedatatum* Schw., *C. sagittatum* Schw.).

On *Viola pedata* L., I, Pennsylvania, *2885*.

Viola primulæfolia L., I, Pennsylvania, *2884* p.p.

Viola sagittata Ait., I, Pennsylvania, *2886*.

Uromyces appendiculatus (Pers.) Fries (*Uredo appendiculata* Pers., *Puccinia Phaseoli-trilobi* Schw.).

On *Phaseolus vulgaris* L., II, North Carolina, Pennsylvania, *2845*.

Strophostyles helvolva (L.) Britton (*Phaseolus trilŏbus* Michx.), III, New York, *2942*.

Uromyces Fabæ (Pers.) DeBary (*Uredo Viciæ* Pers., *Cœoma leguminosarum* Schlecht., *Puccinia Fabæ* Link.)

On *Vicia Faba* L., II, III, North Carolina, Pennsylvania, *2847*, *2943*.

Uromyces Lespedezæ-procumbentis (Schw.) M. A. Curt. (*Puccinia Lespedezæ-procumbentis* Schw., *P. Lespedezæ-polystachyæ* Schw., *P. Lespedezeæ-violaceæ* Schw.).

On *Lespedeza hirta* (L.) Hornem. (*L. polystachya* Michx.), III, North Carolina, *2941*.

Lespedeza procumbens Michx., III, North Carolina, Pennsylvania, *2940.*

Lespedeza violacea (L.) Pers., III, North Carolina, New Jersey, *2941.*

Uromyces Hedysari-paniculati (Schw.) Farl. (*Puccinia Hedysari-paniculati* Schw., *Phragmidium Hedysari* Schw.).

On *Meibomia paniculata* (L.) Kuntze (*Hedysarum paniculatum* L., *Desmodium paniculatum* DC.), III, North Carolina, Pennsylvania, *2947.*

Uromyces proëminens (DC.) Pass. (*Æcidium Euphorbiæ-hypericifoliæ* Schw., *Cæoma Euphorbiæ-hypericifoliæ* Schw.).

On *Chamæsyce maculata* (L.) Small (*Euphorbia maculata* L.), I, North Carolina, *2846.*

Chamæsyce Preslii (Guss.) Arth. (*Euphorbia Preslii* Guss.), II, III, North Carolina, Pennsylvania, *2846*; I, North Carolina, Pennsylvania, *2890.*

Uromyces Spermacoces (Schw.) M. A. Curt. (*Cæoma Spermacoces* Schw., *Puccinia Spermacoces* Schw.).

On *Diodia teres* Walt. (*Spermacoce diodina* Michx.), ii, III, North Carolina, Pennsylvania, *2840.*

Puccinia poculiformis (Jacq.) Wettst. (*Æcidium Berberidis* Pers., *Cæoma berberidatum* Link, *Puccinia graminis* Pers.).

On *Berberis vulgaris* L., I, North Carolina, *2881.*

Triticum vulgare Vill., II, New York, *2817*; III, Pennsylvania, *2905.*

Puccinia epiphylla (L.) Wettst. (*P. Poarum* Niessl).

On *Poa pratensis* L., II, North Carolina, *2818.*

Puccinia virgata Ellis & Ev. (*Cæoma Andropogi* Schw.).

On *Sorghastrum nutans* (L.) Nash (*Andropogon avenaceum* Michx.), II, iii, Pennsylvania, *2820.*

Puccinia Majanthæ (Schum.) Arth. (*Æcidium Uvulariæ* Schw., *Æcidium uvulariatum* Schw., *Cœoma convallariatum* Link, *C. uvulariatum* Schw.).

On *Uvularia perfoliata* L., I, North Carolina, *2858*.

Vagnera racemosa (L.) Morong (*Smilacina racemosa* Desf.), I, Pennsylvania, *2857*.

Puccinia Andropogonis Schw. (*P. Zizaniæ* Schw., *Æcidium Pentastemonis* Schw., *A. pentstemoniatum* Schw., *Cœoma pentstemoniatum* Schw.).

On *Andropogon scoparius* Michx., III, Pennsylvania, *2911*.

Andropogon virginicus L., III, Pennsylvania, *2915*.

Pentstemon australis Small, I, North Carolina, *2864*.

Puccinia fraxinata (Link) Arth. (*Æcidium Fraxini* Schw., *Cœoma fraxinatum* Link, *C. fraxinites* Schw.).

On *Fraxinus* sp., I, North Carolina, Pennsylvania, *2901*.

Puccinia Arundinariæ Schw.

On *Arundinaria* sp., III, Carolina, 2907.

Puccinia Clematidis (DC.) Lagerh. (*P. Agropyri* Ellis & Ev., *Æcidium Clematitis* Schw., *A. clematitatum* Schw., *Cœoma clematitatum* Schw.).

On *Clematis virginiana* L., I, North Carolina, Pennsylvania, *2874*.

Puccinia Eatoniæ Arth. (*Æcidium Ranunculi* Schw.).

On *Ranunculus abortivus* L., I, North Carolina, Pennsylvania, *2875*.

Puccinia hibisciata (Schw.) Kellerm. (*P. Muhlenbergiæ* Arth. & Holw., *Æcidium hibisciatum* Schw., *Cœoma hibisciatum* Schw.).

On *Hibiscus militaris* Cav., I, Pennsylvania, *2877*.

Puccinia Impatientis (Schw.) Arth. (*P. perminuta* Arth., *Æcidium Impatientis* Schw., *A. impatientatum* Schw., *Cœoma impatientatum* Schw.).

On *Impatiens biflora* Walt. (*I. maculata* Muhl.), I, North Carolina, Pennsylvania, *2880.*

Puccinia Sorghi Schw.

On *Zea Mays* L., ii, III, Pennsylvania, *2910.*

Puccinia emaculata Schw.

On *Panicum capillare* L., III, Pennsylvania, *2912.*

Puccinia Windsoriæ Schw.

On *Tridens flavus* (L.) Hitchc. (*Poa quinquifida* Pursh, *P. seslerioides* Michx., *P. flava* L.), III, Pennsylvania, *2914.*

Puccinia lysimachiata (Link) Kern (*P. limosæ* Magn., *Æcidium Lysimachiæ* Schw., *Cœoma lysimachiatum* Link).

On *Lysimachia quadrifolia* L., I, North Carolina, *2863.*

Lysimachia terrestris (L.) B. S. P. (*L. racemosa* Lam., *L. stricta* Ait.), I, North Carolina, Pennsylvania, *2863.*

Puccinia hieraciata (Schw.) Arth. & Bisby (*P. patruelis* Arth., *Æcidium hieraciatum* Schw., *Cœoma hieraciatum* Schw.)

On *Hieracium paniculatum* L., I, Pennsylvania, *2868.*

Puccinia Asterum (Schw.) Kern (*P. extensicola* Plowr., *Æcidium Asterum* Schw., *A. asteratum* Schw., *A. erigeronatum* Schw., *A. Solidaginis* Schw., *Cœoma asteratum* Link, *C. erigeronatum* Schw.).

On *Aster paniculatus* Lam., I, North Carolina, *2870.*

Erigeron annuus Pers. (*E. heterophyllus* Muhl.), I, Pennsylvania, *2869.*

Solidago sp., I, North Carolina, *2870.*

Puccinia Iridis (DC.) Wallr. (*Cœoma Iridis* Schw.).

On *Iris versicolor* L., II, *Pensylvania, 2812*

Puccinia Polygoni-amphibii Pers. (*P. polygonorum* Link, *P. Polygoni-pensilvanici* Schw., *P. concentrica* Schw., *Æcidium Geranii-maculati* Schw.).

On *Geranium maculatum* L., I, North Carolina, *2879*.

Persicaria emersa (Michx.) Small (*Polygonum coccineum* Muhl.), II, III, Pennsylvania, *2918*.

Persicaria pennsylvanica (L.) Small (*Polygonum pennsylvanicum* L.), III, North Carolina, *2917*.

Tovara virginiana (L.) Raf. (*Polygonum virginianum* L.), III, Pennsylvania, *2917*, *2918*.

Puccinia claytoniata (Schw.) Peck (*Æcidium claytoniatum* Schw., *Cœoma claytoniatum* Schw.).

On *Claytonia virginica* L., I, New York, *2892*.

Puccinia Anemones-virginianæ Schw. (*P. solida* Schw.).

On *Anemone virginiana* L., III, North Carolina, Pennsylvania, *2937*.

Puccinia Podophylli Schw. (*P. aculeata* Link, *Æcidium Podophylli* Schw., *A. podophyllatum* Schw.).

On *Podophyllum peltatum* L., I, III, North Carolina, Pennsylvania, *2888*, *2939*.

Puccinia Heucheræ (Schw.) Dietel (*Cœoma Heucheræ* Link, *Uredo Heucheræ* Schw.).

On *Heuchera americana* L., III, North Carolina, *2843*.

Heuchera villosa Michx., III, North Carolina, *2843*.

Puccinia Violæ (Schum.) DC. (*Æcidium Violæ* Schum., *Cœoma violatum* Link).

On *Viola hastata* Michx., I, North Carolina, *2884* p.p.

Puccinia Sambuci (Schw.) Arth. (*P. Bolleyana* Sacc., *Æcidium Sambuci* Schw., *A. sambuciatum* Schw., *Cœoma sambuciatum* Schw.).

On *Sambucus canadensis* L., I, North Carolina, Pennsylvania, *2897*.

Puccinia Grossulariæ (Schum.) Lagerh. (*Cæoma grossulariatum* Link).

On *Carex* sp., III, Pennsylvania, *2908* p.p.

Grossularia oxycanthoides (L.) Mill. (*Ribes oxycanthoides* L.), I, Pennsylvania, *2882*.

Puccinia Eleocharidis Arth. (*Cæoma compositarum* Link p.p.).

On *Eupatorium purpureum* L., I, Pennsylvania, *2867 β*.

Puccinia angustata Peck.

On *Scirpus cyperinus* (L.) Kunth, III, Pennsylvania, *2908 p.p., 2909*.

Puccinia canaliculata (Schw.) Lagerh. (*Sphæria canaliculata* Schw.).

On *Cyperus* sp., III, Pennsylvania, *1487*.

Puccinia Smilacis Schw. (*Æcidium Smilacis* Schw., *A. smilacinatum* Schw., *Cæoma smilacinatum* Link, *Uredo Smilacis* Schw.).

On *Smilax rotundifolia* L., I, North Carolina, *2859;* II, same, *2822;* III, same, *2916*.

Smilax sp., II, Pennsylvania, *2822;* III, same, *2916*.

Puccinia Circææ Pers.

On *Circæa Lutetiana* L., III, North Carolina, Pennsylvania, *2831, 2938*.

Puccinia Pimpinellæ (Strauss) Mart. (*P. Myrrhis* Schw., *P. Osmorrhizæ* C. & P., *Cæoma Anemonis* Schw., *C. Chærophylli* Schw.).

On *Chærophyllum procumbens* (L.) Crantz (*Myrrhis procumbens* Spreng.), II, III, Pennsylvania, *2934*.

Osmorrhiza Claytoni (Michx.) Clarke (*Myrrhis Claytoni* Michx.), II, III, Pennsylvania, *2841*.

Osmorrhiza sp. (not *Anemone* or *Chelidonium*), II., Pennsylvania, *2829;* II, III, New York, *2851*.

Puccinia Menthæ Pers. (*P. Pycnanthemi* Schw., *Cæoma labiatarum* Link, *Uredo Clinopodii* Schw.).

On *Koellia incana* (L.) Kuntze (*Clinopodium incanum* L., *Pycnanthemum incanum* Michx.), II, North Carolina, Pennsylvania, *2823;* III, Pennsylvania, *2920.*

Puccinia verrucosa (Schultz) Link (*P. Hyssopi* Schw.).

On *Agastache scrophulariæfolia* (Willd.) Kuntze (*Hyssopus scrophulariæfolius* Willd.) III, Pennsylvania, *2944.*

Puccinia maculosa Schw. not Strauss (?*Æcidium Dandelionis* Schw.).

On (?) *Adopogon Dandelion* (L.) Kuntze (*Krigia Dandelion* Nutt., *Tragopogon Dandelion* L., *Cynthia Dandelion* DC.), III, North Carolina, *2867 a.*

Adopogon virginicus (L.) Kuntze (*Krigia virginica* Willd., *Cynthia virginica* D. Don), III, Pennsylvania, *2922.*

Puccinia Xanthii Schw.

On *Xanthium* sp., III, North Carolina, Pennsylvania, *2927.*

Puccinia Vernoniæ Schw. (*P. bullata* Schw. not Link, *P. longipes* Lagerh.).

On *Vernonia noveboracensis* (L.) Willd., III, Pennsylvania, *2919.*

Vernonia sp., III, North Carolina, *2919;* III, Pennsylvania, *2926.*

Puccinia Kuhniæ Schw.

On *Kuhnia eupatorioides* L., III, Pennsylvania, *2931.*

Puccinia tenuis (Schw.) Burr. (*Æcidium tenue* Schw., *Cæoma tenue* Schw.).

On *Eupatorium ageratoides* L.f., I, Pennsylvania, *2889.*

Puccinia Heliopsidis Schw.

On *Heliopsis* sp., III, North Carolina, Pennsylvania, *2924.*

Puccinia Helianthi-mollis (Schw.) Arth. & Bisby (*P. Helianthi* Schw., *P. Helianthorum* Schw., *Æcidium Helianthi-mollis* Schw., *A. helianthatum* Schw., *A. trachelifoliatum* Schw., *Cæoma helianthatum* Schw., *C. trachelifoliatum* Schw.).

On *Helianthus mollis* Lam., I, North Carolina, Pennsylvania, *2871*.

Helianthus tracheliifolius Willd., I, Pennsylvania, *2872*.

Helianthus tuberosus L., III, Pennsylvania, *2923*.

Helianthus sp., III, North Carolina, Pennsylvania, *2923*.

Puccinia Verbesinæ Schw. (*Æcidium Verbesinæ* Schw.).

On *Verbesina* [*occidentalis* (L.) Walt.], I, North Carolina, *2870;* III, same, *2925*.

Puccinia gnaphaliata (Schw.) Arth. & Bisby (*P. investita* Schw., *Æcidium gnaphaliatum* Schw., *Cæoma gnaphaliatum* Schw.).

On *Gnaphalium obtusifolium* L. (*G. polycephalum* Michx.), I, Pennsylvania, *2873;* III, same, *2932*.

Puccinia Cirsii Lasch (*P. compositarum* Link, p.p.).

On *Cirsium altissimum* (L.) Spreng. (*Cnicus altissimus* Willd.), III, Pennsylvania, *2921*.

Puccinia Asteris Duby (*P. Asteris* Schw., *P. Helenii* Schw.).

On *Aster cordifolius* L., III, Pennsylvania, *2930*.

Aster paniculatus Lam., III, Pennsylvania, *2930*.

Aster salicifolius Lam. III, Pennsylvania, *2928*.

Puccinia Silphii Schw.

On *Silphium trifoliatum* L., III, North Carolina, *2929*.

Æcidium Apocyni Schw. (*A. apocynatum* Schw., *Cæoma apocynatum* Schw.).

On *Apocynum cannabinum* L., I, North Carolina, *2865*.

Æcidium cimicifugatum Schw. (*Cæoma cimicifugatum* Schw.).
On *Cimicifuga racemosa* (L.) Nutt., I, Pennsylvania, *2876*.

Excluded Names.

The following names and numbers apply to forms that are not rusts, or if so are impossible of identification.

Cæoma (*Uredo*) *rimosum* Link.
On *Scirpus lacustris* L. (*S. acutus* Muhl.), New York, *2819;* no fungus present, probably mechanical injury.

Cæoma (*Uredo*) *Campanularum* Link (*Uredo Campanulæ* Schw.).
On *Specularia perfoliata* (L.) A. DC. (*Campanula perfoliata* L., *C. amplexicaulis* Michx.), North Carolina, Pennsylvania, *2830;* no specimen preserved, probably not a rust.

Cæoma (*Uredo*) *Teucrii* Schw.
On *Teucrium canadense* L. (*T. virginicum* L.), Pennsylvania, *2837;* a Hyphomycetous fungus, *Cercospora Teucrii* (Schw.) Arth. & Bisby (*C. racemosa* E. & M.).

Cæoma (*Uredo*) *apiculosum* Link (*Uredo flosculosorum* Alb. & Schw.).
On various hosts, North Carolina, Pennsylvania, *2844;* no specimen preserved, and the name so loosely applied as to have no value.

Cæoma (*Uredo*) *Lobeliæ-cardinalis* Schw.
On *Lobelia cardinalis* L., Pennsylvania, *2848;* a Hyphomycetous fungus, usually called *Cercospora effusa* (B. & C.) Ellis & Ev.

Cæoma (*Uredo*) *brunneum* Schw.
On an undetermined leguminous plant, Pennsylvania, *2850;* some pathological condition, but no fungus present.

Cæoma (*Ædidium*) *rubellatum* Link (*Ædidium Rumicis* Schw.).

On Rumex "and Grossularia," North Carolina, Pennsylvania, *2862;* no specimen preserved, probably young fungi imperfecti, certainly not a rust.

Cæoma (*Ædidium*) *convolvulatum* Schw. (*Ædidium Ipomœæ-panduranæ* Schw., *A. convolvulatum* Schw.).

On *Ipomœa pandurata* L., North Carolina, Pennsylvania, *2866;* not a rust, but one of the Peronosporales, *Albugo Ipomœæ-panduranæ* (Schw.) Swingle.

Cæoma (*Ædidium*) *osmundatum* Schw. (*Ædidium osmundatum* Schw.).

On *Osmunda spectabilis* Willd., New York, *2895;* not a rust, but a fungus of uncertain affinity, *Mycosyrinx Osmundæ* Peck (*Ustilago Osmundæ* Peck).

Cæoma (*Ædidium*) *urticatum* Link (*Ædidium Asperifolii* Schw.).

On *Cynoglossum virginicum* L. (*C. amplexicaule* Muhl.) and *Urtica* sp., North Carolina, *2898;* no specimen preserved, very doubtful, but certainly not a rust.

Puccinia Bullaria Schw. not Link.

On *Agastache nepetoides* (L.) Kuntze (*Lophanthus nepetoides* Benth., *Hyssopus nepetoides* L.), Pennsylvania, *2935;* no specimen in Philadelphia, but one in Washington, not a rust, may be an ascomycete.

Chronological Enumeration.

After the serial numbers the corresponding numbers from the Carolina list, when there are any, are given in parentheses. The Schweinitz name is followed by the name at present in use, or other identification. An original specimen at the Philadelphia Academy of Sciences is indicated when in an autographic packet by an asterisk *, when mounted by a dagger †.

*†1474 (130)	*Sphæria epiphylla* L.v.S.		= *Ravenelia epiphylla* (Schw.) Diet.
*†1487 –	"	*canaliculata* L.v.S.	= *Puccinia canaliculata* (Schw.) Lagerh.
*†2817 –	*Cæoma* (*Uredo*) *Rubigo* Lk.		= *Puccinia poculiformis* (Jacq.) Wettst.
†2818 (464)	"	*linearis* Lk.	= *Puccinia epiphylla* (L.) Wettst.
*†2819 –	"	*rimosum* Lk.	= no fungus, mechanical injury.
*†2820 –	"	*Andropogi* L.v.S.	= *Puccinia virgata* Ell. & Ev.
*†2821 –	"	*Iridis* L.v.S.	= *Puccinia Iridis* (DC.) Wallr.
†2822 (471)	"	*Smilacis* L.v.S.	= *Puccinia Smilacis* Schw.
2823 (469)	"	*Labiatarum* Lk.	= *Puccinia Menthæ* Pers.
*†2824 (468)	"	*Ipomææ* L.v.S.	= *Coleosporium Ipomææ* (Schw.) Burr.
*†2825 (467)	"	*Elephantopodis* L.v.S.	= *Coleosporium Elephantopodis* (Schw.) Thüm.
*†2826 (472)	"	*Solidaginis* L.v.S.	= *Coleosporium Solidaginis* (Schw.) Thüm.
2827 (473)	"	*Terebinthinaceæ* L.v.S.	= *Coleosporium Terebinthinaceæ* (Schw.) Arth.
*†2828 –	"	*Helianthi* L.v.S.	= *Coleosporium Helianthi* (Schw.) Arth.
†2829 –	"	*Anemonis* L.v.S.	= *Puccinia Pimpinellæ* (Str.) Mart.
2830 (465)	"	*Campanularum* Lk.	= uncertain, probably not a rust.
2831 (466)	"	*Onagrarum* Lk.	= *Puccinia Circææ* Pers.
*†2832 (463)	"	*miniata* Lk.	= *Earlea speciosa* (Fries) Arth.
*2833 –	"	*ruborum* Lk.	= *Kuehneola Uredinis* (Link) Arth.
†2834 (461)	"	*Potentillarum* Lk.	= *Frommea obtusa* (Str.) Arth.
*†2835 (462)	"	*Agrimoniæ* L.v.S.	= *Pucciniastrum Agrimoniæ* (Schw.) Tranz.
*†2836 –	"	*Filicum* Lk.	= *Hyalopsora Aspidiotus* (Peck) Magn.
†2837 –	"	*Teucrii* L.v.S.	= *Cercospora Teucrii* (Schw.) Arth. & Bisby, not a rust.
†2838 (470)	"	*Azaleæ* L.v.S.	= *Pucciniastrum Myrtilli* (Schum.) Arth.
†2839 (480)	"	*Ari virginici* L.v.S.	= *Uromyces Caladii* (Schw.) Farl.
†2840 (502)	"	*Spermacoces* L.v.S.	= *Uromyces Spermacoces* (Schw.) M. A. Curt.
†2841 –	"	*Chærophylli* L.v.S.	= *Puccinia Pimpinellæ* (Str.) Mart.
†2842 –	"	*Hyperici* L.v.S.	= *Uromyces Hyperici-frondosi* (Schw.) Arth.
†2843 (479)	"	*Heucheræ* L.v.S.	= *Puccinia Heucheræ* (Schw.) Diet.

2844 (478) *Cæoma* (*Uredo*) *apiculosum* Lk. = uncertain, name of no value.
*†2845 (477,490) " " *appendiculosum* Lk. = *Uromyces appendiculatus* (Pers.) Fries.
*†2846 (459,474) " " *punctuosum* Lk. = *Uromyces proëminens* (DC.) Pass.
2847 (476) " " *Leguminosarum* Lk. = *Uromyces Fabæ* (Pers.) De-Bary.
†2848 – " " *Lobeliæ cardinalis* L.v.S. = *Cercospora effusa* (B. & C.) Ell. & Ev., not a rust.
†2849 – " " *Thalictri* L.v.S. = *Polythelis Thalictri* (Chev.) Arth.
†2850 – " " *brunneum* L.v.S. = uncertain, not a fungus.
†2851 – " " *Chelidonii* L.v.S. = *Puccinia Pimpinellæ* (Str.) Mart.
2854 – " " *gyrosum* Lk. = uncertain, may be *Phragmidium imitans* Arth.
*†2855 – " " *cylindricum* Lk. = *Melampsora Medusæ* Thüm.
*†2856 – " " *epiteum* Lk. = *Melampsora Bigelowii* Thüm.
†2857 – " (*Æcidium*) *Convallariatum* Lk. = *Puccinia Majanthæ* (Schum.) Arth. & Holw.
†2858 (453) " " *Uvulariatum* L.v.S. = *Puccinia Majanthæ* (Schum.) Arth. & Holw.
†2859 (452) " " *Smilacinatum* L.v.S. = *Puccinia Smilacis* Schw.
†2860 (457) " " *Aroidatum* L.v.S. = *Uromyces Caladii* (Schw.) Farl.
*†2861 – " " *Dracontionatum* L.v.S. = *Uromyces Caladii* (Schw.) Farl.
2862 (433) " " *rubellatum* Lk. = uncertain, not a rust.
†2863 (438) " " *Lysimachiatum* Lk. = *Puccinia lysimachiata* (Link) Kern.
*2864 (449) " " *Pentstemoniatum* L.v.S. = *Puccinia Andropogonis* Schw.
*†2865 (448) " " *Apocynatum* L.v.S. = *Æcidium apocynatum* Schw.
*†2866 (454) " " *Convolvulatum* L.v.S. = *Albugo Ipomœæ-panduranæ* (Schw.) Swingle, not a rust.
*2867 (434) " " *Compositarum* Lk. = α uncertain, may be *Puccinia maculosa* Schw.; β = *Puccinia Eleocharidis* Arth.
†2868 – " " *Hieraciatum* L.v.S. = *Puccinia hieraciata* (Schw.) Arth. & Bisby.
†2869 – " " *Erigeronatum* L.v.S. = *Puccinia Asterum* (Schw.) Kern.
2870 (444,446) " " *Asteratum* L.v.S. = *Puccinia Asterum* (Schw.) Kern.
2870 (445) " " *Asteratum* L.v.S. = *Puccinia Verbesinæ* Schw.

†2871 (450) *Cæoma* (*Ægidium*) *Helianthatum* L.v.S. = *Puccinia Helianthi-mollis* (Schw.) Arth. & Bisby.

*†2872 – " " *Trachelifoliatum* L.v.S. = *Puccinia Helianthi-mollis* (Schw.) Arth. & Bisby.

*†2873 – " " *Gnaphaliatum* L.v.S. = *Puccinia gnaphaliata* (Schw.) Arth. & Bisby.

2874 (447) " " *Clematitatum* L.v.S. = *Puccinia Clematidis* (DC.) Lagerh.

†2875 (440) " " *Ranunculaceatum* Lk. = *Puccinia Eatoniæ* Arth.

†2876 – " " *Cimicifugatum* L.v.S. = *Ægidium cimicifugatum* Schw.

†2877 – " " *Hibisciatum* L.v.S. = *Puccinia hibisciata* (Schw.) Kellerm.

2878 – " " *Hepaticatum* L.v.S. = *Tranzschelia punctata* (Pers.) Arth.

†2879 (443) " " *Geraniatum* Lk. = *Puccinia Polygoni-amphibii* Pers.

†2880 (442) " " *Impatientatum* L.v.S. = *Puccinia Impatientis* (Schw.) Arth.

†2881 (437) " " *Berberidatum* Lk. = *Puccinia poculiformis* (Jacq.) Wettst.

†2882 – " " *grossulariatum* Lk. = *Puccinia Grossulariæ* (Schum.) Lagerh.

*†2883 (451) " " *Hypericatum* L.v.S. = *Uromyces Hyperici-frondosi* (Schw.) Arth.

†2884 (439) " " *Violatum* Lk. = { *Puccinia Violæ* (Schum.) DC. / *Uromyces pedatatus* (Schw.) Sheldon.

*†2885 – " " *pedatatum* L.v.S. = *Uromyces pedatatus* (Schw.) Sheldon.

†2886 – " " *sagittatum* L.v.S. = *Uromyces pedatatus* (Schw.) Sheldon.

*†2887 (458) " " *luminatum* L.v.S. = *Kunkelia nitens* (Schw.) Arth.

*†2888 (435) " " *Podophyllatum* L.v.S. = *Puccinia Podophylli* Schw.

†2889 – " " *tenue* L.v.S. = *Puccinia tenuis* (Schw.) Burr.

†2890 [455] " " *Euphorbiæ-hypericifoliæ* L.v.S. = *Uromyces proëminens* (DC.) Pass.

*†2891 – " " *Houstoniatum* L.v.S. = *Uromyces houstoniatus* (Schw.) Sheldon.

*†2892 – " " *Claytoniatum* L.v.S. = *Puccinia claytoniata* (Schw.) Peck.

†2893 – " " *Pyrolatum* L.v.S. = *Melampsoropsis Pyrolæ* (DC.) Arth.

*†2894 – " " *myricatum* L.v.S. = *Gymnosporangium myricatum* (Schw.) Fromme.

†2895 – " " *Osmundatum* L.v.S. = *Mycosyrinx Osmundæ* Peck, not a rust.

†2896 – *Cæoma* (*Æcidium*) *Pyratum* L.v.S. = *Gymnosporangium Juniperi-virginianæ* Schw.

*†2897 (441) " " *sambuciatum* L.v.S. = *Puccinia Sambuci* (Schw.) Arth.

2898 (436) " " *Urticatum* Lk. = uncertain; not a rust.

*†2899 (432) " (*Ræstelia*) *Cylindrites* Lk. α = *Gymnosporangium globosum* Farl.
β = " *hyalinum* (Cooke) Kern.
γ = " *trachysorum* Kern.
δ = " *Juniperi-virginianæ* Schw.

*†2900 (431) " " *Ræstelites* Lk. = " *Juniperi-virginianæ* Schw. / " *globosum* Farl.

†2901 (430) " " *Fraxinites* L.v.S. = *Puccinia fraxinata* (Link) Arth.

*†2902 – " " *Botryapites* L.v.S. = *Gymnosporangium botryapites* (Schw.) Kern.

†2903 (456) " (*Peridermium*) *Pineum* Lk. = *Cronartium Quercus* (Brond.) Schröt. / *Peridermium intermedium* Arth. & Kern.

†2904 – " " *germinale* L.v.S. = *Gymnosporangium germinale* (Schw.) Kern.

*2905 (492) *Puccinia graminis* Lk. = *Puccinia poculiformis* (Jacq.) Wettst. in part.

*2906 – " *striola* Lk. = *Uromyces Junci-effusi* Syd.

*2907 (487) " *Arundinariæ* L.v.S. = *Puccinia Arundinariæ* Schw.

*2908 – " *punctum* Lk. = *Puccinia Grossulariæ* (Schum.) Lagerh. / *Puccinia angustata* Peck.

*2909 – " *Scirpi* Lk. = *Puccinia angustata* Peck.

*2910 – " *Sorghi* L.v.S. = *Puccinia Sorghi* Schw.

*2911 – " *Andropogi* L.v.S. = *Puccinia Andropogonis* Schw.

*2912 – " *emaculata* L.v.S. = *Puccinia emaculata* Schw.

*2913 – " *Junci* L.v.S. = *Uromyces Junci-effusi* Syd.

*2914 – " *Windsoriæ* L.v.S. = *Puccinia Windsoriæ* Schw.

*2915 – " *Zizaniæ* L.v.S. = *Puccinia Andropogonis* Schw.

2916 – " *Smilacis* L.v.S. = *Puccinia Smilacis* Schw.

*2917 – " *Polygonorum* Lk. = *Puccinia Polygoni-amphibii* Pers.

*2918 – " *concentrica* L.v.S. = *Puccinia Polygoni-amphibii* Pers.

*2919 (501) " *bullata* L.v.S. = *Puccinia Vernoniæ* Schw.

2920 – " *Pycnanthemi* L.v.S. = *Puccinia Menthæ* Pers.

*2921 – " *compositarum* Lk. = *Puccinia Cirsii* Lasch.

2922 – " *maculosa* [L.v.S. not] Strauss = *Puccinia maculosa* Schw.

2923 (495) " *Helianthorum* L.v.S. = *Puccinia Helianthi-mollis* (Schw.) Arth. & Bisby.

2924 (493)	*Puccinia Heliopsidis* L.v.S.	=	*Puccinia Heliopsidis* Schw.
2925 (496)	" *Verbesinæ* L.v.S.	=	*Puccinia Verbesinæ* Schw.
*2926 –	" *Vernoniæ* L.v.S.	=	*Puccinia Vernoniæ* Schw.
*2927 (500)	" *Xanthii* L.v.S.	=	*Puccinia Xanthii* Schw.
*2928 –	" *Helenii* L.v.S.	=	*Puccinia Asteris* Duby.
*2929 –	" *Silphii* L.v.S.	=	*Puccinia Silphii* Schw.
*2930 –	" *Asteris* L.v.S.	=	*Puccinia Asteris* Duby.
*2931 –	" *Kuhniæ* L.v.S.	=	*Puccinia Kuhniæ* Schw.
2932 –	" *investita* L.v.S.	=	*Puccinia gnaphaliata* (Schw.) Arth. & Bisby.
2933 (499)	" *Galii* L.v.S.	=	*Puccinia punctata* Link.
*2934 –	" *Myrrhis* L.v.S.	=	*Puccinia Pimpinellæ* (Str.) Mart.
2935 –	" *Bullaria* [L.v.S. not] Lk.	=	uncertain; not a rust.
2936 –	" *anemones* Lk.	=	*Polythelis fusca* (Pers.) Arth.
2937 (486)	" *solida* L.v.S.	=	*Puccinia Anemones-virginianæ* Schw.
*2938 (491)	" *Circææ* Lk.	=	*Puccinia Circææ* Pers.
2939 (489)	" *aculeata* L.v.S.	=	*Puccinia Podophylli* Schw.
2940 (497)	" *Lespedezæ procumbentis* L.v.S.	=	*Uromyces Lespedezæ-procumbentis* (Schw.) M. A. Curt.
2941 (498)	" " *violaceæ* L.v.S.	=	*Uromyces Lespedezæ-procumbentis* (Schw.) M. A. Curt.
2942 –	" *Phaseoli trilobi* L.v.S.	=	*Uromyces appendiculatus* (Pers.) Fries.
2943 –	" *Fabæ* Lk.	=	*Uromyces Fabæ* (Pers.) De-Bary.
*2944 –	" *Hyssopi* L.v.S.	=	*Puccinia verrucosa* (Schultz) Link.
2945 –	" *Potentillæ* L.v.S.	=	*Frommea obtusa* (Strauss) Arth.
*2946 –	" *Ari triphylli* L.v.S.	=	*Uromyces Caladii* (Schw.) Farl.
2947 (503)	*Phragmidium Hedysari* L.v.S.	=	*Uromyces Hedysari-paniculati* (Schw.) Farl.
†3084 –	*Seiridium marginatum* [L.v.S. not] Lk.	=	*Earlea speciosa* (Fries) Arth.
3085 –	" *S(i)milacis* L.v.S.	=	*Earlea speciosa* (Fries) Arth.
†3094 –	*Gymnosporangium Juniperi* Lk.	=	*Gymnosporangium germinale* (Schw.) Kern.
†3095 –	*Podisoma Juniperi* Lk.	=	*Gymnosporangium clavariæforme* (Jacq.) DC.
†3096 (504)	" *macropus* L.v.S.	=	*Gymnosporangium Juniperivirginianæ* Schw.

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